THE

MEDICAL STUDENT'S

VADE MECUM,

CONTAINING EXAMINATIONS UPON

ANATOMY, CHEMISTRY, MATERIA MEDICA,
SURGERY, PRACTICE OF MEDICINE,
OBSTETRICS, AND POISONS.

Adapted to the use of Medical Students generally.

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PREFACE.

The object of this little volume is to provide the Student of Medicine with a short and succinct view of the most important facts and principles which engage his attention during his Academic studies, in order that he may refresh, and fix more firmly upon his memory, what he has read and heard; as well as to enable him properly to arrange his knowledge, so as to make a right use of it. With such a Vade Mecum, every leisure moment, whether in the class-room or elsewhere, may be profitably employed.

The author was fully aware that many works of a similar kind have been published; but he had reason, when a student, to be dissatisfied with all of them. To supply what he considered their deficiencies, were the reasons for undertaking this work. Whether he has accomplished his object, he leaves to the student to decide.

The sources to which he has been mostly indebted in forming this compilation, are Horner's and Paxton's Anatomy; Turner's and Hare's Chemistry; Gibson's and Cooper's Surgery; Mussey's Lectures; United States' Dispensatory; Wood's Syllabus; Dewees' and Rigby's Midwifery; Eberle's Practice of Medicine; Gerhard's Clinical Guide; Locke's Lecture on Toxicology; Orfila on Poisons, &c. &c.

Cincinnati, November, 1844.

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MEDICAL STUDENT'S VADE MECUM.

PART I.—ANATOMY.

Q. What is Anatomy? A. The science of organization.

How is it divided? Into Vegetable and Animal.

How is Animal Anatomy divided? Into Human and Comparative.

What is Human Anatomy? The Anatomy of man.

What is Comparative Anatomy? The anatomy of all other animals except man.

How is human anatomy divided? Into Descriptive or Special, General, and Pathological.

What is Descriptive or Special Anatomy? That which describes the form, size, position, and connexions of organs.

What is General Anatomy? That which treats of the structure of the simple tissues of the body.

What is Pathological Anatomy? That which relates to the diseased structure of the organs.

What are the simple tissues of the human body? The Cellular, Adipose, Vascular, Nervous, Osseous, Fibrous, Cartilaginous, Fibro-Cartilaginous, Muscular, Erectile, Mucous, Serous, Dermoid, and Glandular, fourteen in number.

Under what divisions is human anatomy studied? Osteology, or a description of the bones. Syndesmology, of the ligaments. Myology, of the muscles. Splanchnology, of the viscera. Adenology, of the glands. Angiology, of the vessels. Neurology, of the nerves. Dermology, of the skin.

What are the inorganic elements of the body? Carbon, nitrogen, oxygen, hydrogen, phosphorus, sulphur, iron, calcium, sodium, potassium, &c.

What are the organic elements? Gelatin, fibrin, albumen, mucous, fat, &c.

Skeleton.

What is the bony frame work of the human body called? Skeleton.

What is a natural skeleton? When the bones are held together by their natural connexions of ligaments, cartilages, &c.

What is an artificial skeleton? When the bones are held together by artificial means.

Suppose a line, called the median, drawn from the top of the head downward through the middle of the skeleton, will these two sides be similar? Yes, the bones of the two sides willbe perfectly alike: and where bones are divided, tho two halves will be symmetrical.

What are the regional divisions of the skeleton? Head, Trunk, Superior, and Inferior extremities.

What is the number of bones in persons of middle age? For the trunk—twenty-four true vertebrae, one sacrum, four coccygeal, two innominata, twelve ribs on each side, and one sternum. For the head—eight in the cranium, fourteen for the face, and one hyoid. For the upper extremities—thirty-four to each side. For the inferior extremities—thirty-two to each side. In all, two hundred and eleven, not including the bones of the tympanum and teeth. In early life the number is greater, and in old age diminished, by the growing together of bones originally distinct.

How are bones divided in regard to their shape? Into ossa longa or long bones; ossa lata or broad bones; and ossa crassa or thick bones.

What is an eminence on a bone called? Apophysis or process when united, and epiphysis when separated by cartilage.

What other names are applied to eminences of bone depending upon their shape, situation, and use? Heads, when convex, roundish, and smooth. Necks, when smaller at the middle and increase towards the extremity. Condyles, when the head is large and unequally rounded. Tubercles, or tuberosities, when uneven, rough, and irregular. Spines or spinous processes, when sharp or pointed Cristae, when there are long and sharp elevations. Coronoid, if the termination is in a sharp edge. Mastoid, styloid, coracoid, &c. from their resemblance to certain other things. Oblique,

transverse, &c., from situation. Trochanters, when they serve to turn a bone.

What names are given to depressions? Cotoloyd, when deep and cup-like. Alveoli, or sockets, as the sockets for the teeth; and glenoid, when superficial.

How are bones divided in regard to density? Into compact and cellular; the former is situated external, and the latter internal.

What is the composition of bones? Animal and earthy matter. The minute analysis of which is gelatin, 32 parts, phosphate of lime, 51 parts; carbonate of lime, 11 parts; fluate of lime, 2 parts; phosphate of magnesia, 1 part, and muriate of soda, 1 part. The bones also contain a little iron manganese, silex, alumine, and phosphate of ammonia.

Upon which of these primary constituents does the hardness of bone depend? The earthy, and may be obtained by calcination.

How may the animal part be demonstrated? By immersion for some time in dilute muriatic acid, the earthy parts will be dissolved, leaving the animal.

What is the structure of bones? It is fibrous and laminated, supplied with blood vessels, nerves, and absorbents.

What is meant by periosteum? It is the fibrous membrane which surrounds bones except at their articular cartilages, and receives the insertion of tendons, ligaments, aponeuroses, &c. Its use is also to conduct the blood vessels to the bones, and give protection and shape to them.

What is meant by the medullary membrane? It is a very delicate membrane lining the internal structure of bone which secretes the medulla, and serves the purpose of an internal periosteum.

Are bones perfectly ossified at birth? No: the ends of the long bones are cartilaginous; the corpus and tarsus are nearly in the same state, and the processes generally are very imperfectly developed.

What are the stages of ossification? There are three. The first is the mucous or pulpy, which exists during the first month; second, cartilaginous, commencing with the second month; and third, osseous, which commences at the end of the second month in some of the bones: when ossification commences, the color of the cartilage becomes deeper and in the middle of a yellow color; the vessels dilate, carry

red blood, and a red point is perceived in the centre of the cartilage, which is called punctum ossificationis, from which the deposit increases on its surface. The long bones commence by a small ring which extends itself. The flat bones commence by one or more points and radiate to the periphery. The thick bones may have a single point or several, and they all grow by successive depositions on the outer surface or at the ends.

At what age are bones most dense? At the middle period of life; and as age advances they grow lighter, more cellular and brittle, and the proportion of animal matter is diminished.

What is the process of the formation of callus? When a fracture takes place there is effusion of blood into it; the soft parts swell; the blood is absorbed, and while this is going on, there is an effusion of coagulating lymph; an osseous ring is then formed around the seat of fracture, with a pin in its centre. Next, the extremities of bone begin to fuse themselves together; which when complete, the bony ring and pin being superfluous, are absorbed, and the cavity, cellular structure, membrane, &c. are re-established. The process is entirely similar in other respects to the formation of new bone. In compound fractures, granulations frequently spring up from the surface of the bone in the same order as in the formation of new bone.

Trunk.

What constitutes the Trunk? The Spine, Thorax, and Pelvis.

Where is the spine situated? At the posterior part of the trunk and extends from the head to the inferior opening of the pelvis.

What composes it? It consists of twenty eight or twenty nine distinct pieces of which the upper twenty-four are true or moveable vertebræ, the twenty-fifth is the sacrum or pelvic vertebra, and the remainder are the caudal vertebræ.

What are the curvatures of the spine? The cervical portion is convex anteriorly and concave posteriorly: thoracic portion concave in front and convex behind; lumbar portion convex in front and concave behind; pelvic and caudal concave in front and convex behind; and depend upon the different degrees of thickness of the bodies of the vertebræ and the intervening cartilages.

How are the true vertebræ divided? Into seven cervical, twelve dorsal, and five lumbar.

What does a vertebra consist of? A body, seven processes (two transverse, one spinous, and four oblique), and a hollow for lodging the spinal marrow which is formed by the body anteriorly and the processes posteriorly and laterly.

What characterizes a cervical vertebra? Smaller than the others; longest latterly; spinal foramen large; spinous process forked; transverse processes short, double, and perforated for the passage of the vertebral artery and vein. There are also differences between these vertebræ themselves.

What is the peculiarity of the first cervical vertebra and what is its name? It has no body or spinous process, being a simple ring and is called atlas.

What is there peculiar to the second cervical vertebra and what is its name? It has upon its upper part a process called odontoides or dens and the vertebra itself is called vertebra dentata.

What characterizes a dorsal vertebra? Body longer antero-posteriorly and more cylindrical than the cervical, upper and lower margin marked with a small articular face for articulating with the ribs, spinal foramen small and round, diminishing in size from first to third, and these increase to the last.

What characterizes a lumbar vertebra? Body larger; long diameter transverse; spinal foramen triangular and larger than the dorsal; transverse processes long and stand out at right angles, spinous process thick, horizontal, and terminated in an oblong tubercle.

Where is the sacrum situated and what characterizes it? It is at the posterior part of the pelvis, forms part of its superior boundary, and is the pedestal of the spine. It is triangular, concave before, and irregularly convex behind, where it is divided by spinous processes; articulates laterally with the ossa innominata, and originally consisted of five pieces. It has four anterior and four posterior foramina; and its canal is triangular.

What are the characteristics of the coccyx? It resembles the sacrum, only much smaller, consists of four pieces united by fibro-cartilage, corresponds with the tails of animals, and is articulated superiorly to the sacrum.

What are the uses of the vertebral column? It gives a

secure lodgement to the spinal marrow, is a line of support to the trunk, and the centre of its movements.

Where are the ossa innominata situated? They are two in number and situated on either side of the sacrum, form the lateral and anterior parts of the pelvis, and articulate with the os femoris on each side by the acetabula.

What are the original divisions of each os innominatum? Ilium, ischium, and pubis.

What characterizes the ilium? It is the largest of the the three, forms the upper and rounded part of the innominatum, articulates with the sacrum, and forms two-fifths of the acetabulum.

What characterizes the pubis? It is the anterior part of the innominatum and is the smallest of the three; it is composed of a body and two large branches, one running downwards to join the ischium and the other backwards and upwards to the ilium; it articulates with its fellow by a flat surface called the symphysis, it forms one fifth of the acetabulum, and contributes to the formation of the obturator foramen.

What characterizes the ischium? It forms the posterior inferior part of the os innominatum, is next in size to the ilium, triangular in form, its anterior extremity bends upwards to join the pubis which is the crus and the remainder is the body, the lower part of which is the tuberosity; it forms two fifths of the acetabulum.

What is meant by the Thorax? It is the upper part of the trunk, and is formed by the dorsal vertebræ behind, sternum in front, and by the ribs and their cartilages intermediate.

How are the ribs divided? Into seven true and five false.

What characterizes the ribs? They are paraboloid, have an internal and external surface, an upper and lower margin, a sternal and vertebral extremity, an angle, head, tubercle, and neck.

Where is the sternum situated? In the middle front part of the thorax, and is divided into three portions, the lower of which is sometimes called xyphoid cartilage.

Head.

How are the bones of the head divided? Into those of the cranium and face.

What bones constitute the cranium? The os frontis, os

occipitis, two ossa parietalia, two ossa temporum, os ethmoides and the os sphenoides. These form the cavity for the brain, which has three diameters; the antero-posterior; from the lower part of the os frontis to the protuberance on the middle of the inferior surface of os occipitis, six and a half inches; the lateral includes the space between the superior margins of the ossa tempora, four and three-fourth inches; and the vertical which is taken from the centre of the occipital foramen to the centre of the suture between the parietal bones, four and a half inches.

What are the characteristics of the os frontis? It forms the anterior, a portion of the superior, lateral, and inferior parietes of the cranium; external face convex, internal concave, symmetrical, and forms the upper and anterior part of the orbit. It has two internal and two external angular processes, a nasal process, two superciliary ridges, a temporal ridge, two orbitar plates or processes, two elevations of the frontal sinuses, and it articulates with the parietal, ethmoidal, and sphenoidal bones of the cranium, and several of the face.

What are the characteristics of the ossa parietalia? They form the superior and lateral parts of the middle of the cranium, they are quadrilateral, convex externally, and concave internally. They articulate together, with the frontal, the sphenoid, the temporal, and the occipital bones. They have each a deep groove commencing at their anterior inferior angle internally, for the middle meningeal artery.

What are the characteristics of the os occipitis? It is quadrilateral, resembling a trapezium, convex externally, and concave internally, both surfaces are modified by ridges and processes. It forms a large portion of the posterior and inferior parietes of the cranium, and has a large foramen called foramen magnum, which transmits the medulla spinalis, nervi accessorii, and the vertebral arteries and veins, the anterior condyloid foramen, which transmits the ninth pair of nerves, and the posterior condyloid, which transmits a cervical vein to the lateral sinus. It articulates with the parietal, temporal, and sphenoid bones.

What are the characteristics of the ossa temporum? They form portions of the inferior lateral parietes, and of the base of the cranium, have an irregular figure, and are divided into the anterior portion called squamous; posterior, called mastoid, and the middle, or petrous portion. The mastoid portion has cells or sinuses which communicate with the

tympanum. The elevations on each side are the mastoid, the zygomatic, the styloid, and the vaginal processes, the ridge internally, and the petrous portion. The depressions are the glenoid cavity, the fissura glasseri, a fossa behind the mastoid process, and the temporal. The foramina are the meatus auditorius internus and externus, the carotid, the stylo-mastoid, the eustachian canal, and the openings of the aqueduct of the cochlea and vestibule. They are connected to the sphenoid, parietal, and occipital, bones by sutures.

What are the characteristics of the os sphenoides? It is symmetrical, but very irregular, and placed across the middle of the base of the cranium. It consists of a body and large processes called the greater and lesser wings, the latter of which are the apophyses of Ingrassias. There are also the pterygoid, internal and external, anterior and posterior clinoid, sphenoidal or azygos, and olivary processes. The foramina are opticum, lacerum superius or sphenoidale, ovale, rotundum, spinale, and pterygoideum. It articulates above and in front with the vomer, frontal, ethmoidal, malar, and parietal bones; laterally with the temporal; behind with the occipital, and with the palate bones by the pterygoid processes.

What do these foramina severally transmit? The opticum transmits the optic nerve and ophthalmic artery; the lacerum superius transmits the third, fourth, first branch of the fifth, and the sixth pair of nerves; the rotundum transmits the second branch of the fifth pair of nerves; the ovale the third branch of the fifth pair; the spinale the middle artery of the dura mater; and the pterygoideum the pterygoid nerve which is a recurrent of the second branch of the fifth pair.

What are the characteristics of the os ethmoides? It is situated between the orbitar processes of the os frontis; it is cuboidal, very light, and cellular. The part between the orbitar processes superiorly is called the cribriform plate with the crista galli in the centre.

What is meant by the pyramids of Wistar? They are triangular hollow pyramids on the posterior part of each cellular portion of the ethmoid bone consisting of a single cell; and the azygos process of the sphenoid bone is received between them. They are found in children from three to eight years of age. The pyramid towards puberty becomes a part

of the sphenoid bone and detaches itself from the ethmoid by a suture.

What composes the face? Fourteen bones; thirteen of which are in the upper jaw. They are the ossa maxillaria superiora, ossa malarum, ossa nasi, ossa turbinata inferiora, ossa palati, and the vomer. The fourteenth is the os maxillare inferius.

What are the characteristics of the ossa maxillaria superiora? They are distinguished by their superior size and composing nearly the whole front of the upper jaw. They also form a portion of the orbit of the eyes and have alveolar, malar, nasal, and palatine processes. They have also a large cavity in each called the antrum highmorianum which communicates with the nose. They articulate with the frontal, nasal, unguiform, malar, and ethmoidal bones superiorly; behind to the palate bones; in the middle to the vomer and to each other; and by the nasal surface to the inferior spongy.

What are the characteristics of the ossa palati? They are placed posteriorly to the superior maxillary bones, between them and the pterygoid processes of the sphenoid.—They are each divided into three portions; the horizontal or palate plate, the vertical or nasal plate, and the orbitar or oblique plate. They have six articulations; viz:—with the maxillary bones, sphenoid, ethmoid, inferior spongy, vomer, and with each other.

What are the characteristics of the ossa nasi? They are two in number and fill up the vacancy between the nasal processes of the superior maxillary bones, and form what is termed the bridge of the nose. They articulate with each other anteriorly, os frontis superiorly, upper maxillary posteriorly, and with the septum narium where they unite together in front.

What are the characteristics of the ossa unguis? They are small and are placed at the internal side of the orbit between the nasal processes of the upper maxillary bone and the planar plate of the ethmoid; assist in forming the ductus ad nasum, articulate loosely with the os frontis, upper maxillary, planar plate of the ethmoid, and inferior spongy bone of the nose.

What are the characteristics of the ossa malarum? They are situated at the external orbit of the eye and form the

middle and external parts of the face. They are quadrangular, with irregular margins, have superior and inferior orbitar, zygomatic, and maxillary processes. They articulate on each side with the maxillary, frontal, sphenoidal, and temporal bones.

What are the characteristics of the ossa spongiosa inferiora? They are situated at the inferior and lateral parts of the nose below the opening into the antrum highmorianum; they have a concave and convex surface with the concavity looking towards the maxillary bones.

What are the characteristics of the vomer? It is placed between the nostrils, and forms a part of the septum. It articulates below with the nasal spine of the superior maxillary and palate bones, and above to the nasal lamella of the ethmoid and azygos processes of the sphenoid.

What are the characteristics of the os maxillare inferius? It forms the lower boundary of the face and is capable of motion. It is composed of a body and two extremities or rami, has alveolar processes, two angles, condyles, and coronoid processes.

How are the bones of the cranium united? By sutures; they are the coronal, the sagital, the lambdoidal, and the two squamous. In the lambdoidal are frequently found small bones called ossa wormiana, or triquetra, and occasionally these are found in the other sutures. The uses of the sutures are not fully settled among anatomists and physiologists.

What is the structure of the bones of the cranium? They are composed of two tables united by cellular substance called diploe which begins to show itself at two or three years of age. The internal table is thin and brittle and is called vitreous.

How many bones enter into the composition of the orbit? Seven; the frontal, the malar, the superior maxillary, the planar plate of the ethmoid, the unguiform, sphenoid, and palate.

Where is the os hyoides situated? At the root of the tongue within the circle of the lower jaw and insulated, having no connection with any other bone except by muscles and ligaments.

Superior Extremities.

How are the superior extremities divided? They are divided on either side into shoulder, arm, fore-arm and hand.

What composes the shoulder? The clavicle and scapula, which occupy the superior, lateral, and posterior parts of the thorax.

What are the characteristics of the scapula? It is on the posterior part of the thorax and extends from the second to seventh rib inclusive; it is triangular, has an anterior face or venter and a posterior face or dorsum, a superior edge or costa, an external edge or inferior costa, and a posterior or internal edge termed the base; has three angles — one superior, one inferior, and the other anterior or external; a spine running from the posterior edge obliquely towards the anterior angle, rapidly increasing until it rises and is elongated forwards and upwards and overhangs the shoulder joint, and is called the acromion process.; a cervix, coracoid process, and a glenoid cavity, for articulating with the humerus.

What are the characteristics of the clavicle? It is a long bone situated transversely at the superior and anterior parts of the chest, extending from the sternum to the acromion process of the scapula; it is compared in shape to the letter *f* and is divided into body, sternal, and scapular extremities.

What are the characteristics of the humerus? It is cylindrical, both extremities enlarged; the superior is called its head which is hemispherical, and attached to the body of the bone by the neck; it has two tuberosities, external and internal; two sigmoid cavities; one receives the coronoid and the other the olecranon process of the ulna; and two condyles. The part between the extremities is termed body.

What are the bones of the fore-arm? The ulna and radius.

What are the characteristics of the ulna? It is situated on the inside of the fore-arm with the little finger; nearly straight, much larger at the upper than at the lower extremity; the upper or humeral extremity has an olecranon and a coronoid process, with the greater sigmoid cavity between them for articulating with the humerus, and the lesser on the radial surface of the coronoid for articulating with the head of the radius; the lower extremity has a styloid process and an articular surface for articulating with the carpus, and one for articulating with the radius.

What are the characteristics of the radius? It is shorter than the ulna, situated exteriorly to it and extends from the os humeri to the wrist; it is smaller at the upper than at the lower extremity.

What composes the hand? The carpus, metacarpus and phalanges.

What are the bones of the carpus? There are two rows: in the first are the scaphoides, lunare cuneiforme, and pisiforme; in the second are the trapezium, trapezoides magnum and unciforme.

Where are the metacarpus situated? Between the carpus and phalanges of the fingers and thumb, and are five in number.

How many phalanges are there? Fourteen; three for each finger and two for the thumb; the bone adjoining the metacarpus is the first, the middle is the second, and the other the third.

Inferior Extremities.

What are the bones of each inferior extremity? The os femoris, tibia, fibula, patella, tarsus, metatarsus and phalanges.

What are the characteristics of the os femoris? It is the largest bone in the human body; at its superior extremity it has three well marked eminences, the head, and greater and lesser trochanters; the head is supported by the neck which projects from the body of the bone between the trochanters; the line between the trochanters is called the linea quadrata. Its inferior extremity is larger and divided into two parts, the internal and external condyle. The linea aspera begins broad, rough, and flat, on a level with the trochanter minor; as it descends it becomes more elevated, and its lower extremity divides into two superficial ridges, one running to each condyle.

What are the bones of the leg? The tibia, fibula, and patella.

What are the characteristics of the tibia? It is on the internal side of the leg, and extends from the thigh to the foot; it is the longest and largest bone in the body, except the femoris; the superior extremity is much larger than the inferior; its inferior internal part is called the internal malleolus.

What are the characteristics of the fibula? It is at the

external side of the tibia and extends from its head to the foot; its inferior and external part is called the external malleolus. The tibia and fibula articulate below with the astragalus.

What are the characteristics of the patella? It is small, intermediate to the thigh and leg, and placed on the front of the knee joint; its anterior face convex and rough, and its circumference is nearly oval with the long diameter transverse.

How is the foot divided? Into tarsus, metatarsus, and toes or phalanges.

What composes the tarsus? Seven bones, viz; os calcis, the astragalus, the naviculare, the cuboides, the cuneiforme externum, cuneiforme medium, and cuneiforme internum.

Cartilage.

What are the characteristics of cartilage? It is a substance of a white or pearly color, hard, very elastic, found in various parts of the body, especially on the articular surfaces of bones, the end of the nose, the edges of the eyelids, the ear, wind pipe, end of ribs, &c.

How are the cartilages divided? Into articular or those which cover the surface of bones in moveable joints; the interarticular or those which are interposed between the ends of bones to form a moveable socket; the connecting or those which unite the articular surfaces of bones by an immoveable union, as the sutures of the skull, the connexions between the bones of the pelvis &c.; and the cartilages of cavities or those which form the larynx, trachea, part of the nose, &c.

What is the membrane surrounding cartilage called? Perichondrium, and it is similar to the periosteum.

Of Ligaments.

What are the characteristics of the ligamentous or desmoid tissue, called also fibrous tissue? It may be known by its whiteness, firmness, the unyielding nature of its materials, and its fibrous arrangement. It is very generally diffused in the human body and has a very close connection with the cellular texture; it also serves the purpose of connecting the bones in their articulations. The sensibility of this system is extremely obscure; the usual mechanical and

chemical irritants do not affect it; it may, however, be produced by a twisting motion, or when under a state of inflammation, as in gout, rheumatism, &c.

What is meant by ligaments? They are those organs which tie the bones together, and in the moveable joints are divided into the capsular, and the funicular. The first are open at the end and envelope the ends of the bones, extending from one to the other; the second are mere cords, extending from one bone to the other, and may be flattened, round or oval; they may be either internal or external to the capsular ligament.

What is meant by a synovial membrane? It is a membrane lining each moveable articulation, reflected over the internal face of the capsular ligament and the articular cartilages; it is a perfect sac, and differs from the capsular ligament in having no opening in it; it is white, thin, semi-transparent and soft, belongs to the class of serous membranes, and the fluid secreted by it is called synovia, the use of which is to diminish friction, and facilitate motion.

What enters into the articulation of the lower jaw? Besides the bones tiped with their cartilages there is a capsular ligament, an internal, external, and stylo-maxillary ligament, and a small triangular ligament discovered by Caldani, two synovial membranes, an interarticular cartilage and an erectile tissue.

What are the ligaments of the vertebræ? The intervertebral, anterior and posterior vertebral, a capsular at the articulations of the oblique processes, interosseous, ligamentum nuchæ, ligamentum flava (23 pairs); between the occiput and atlas is the anterior and posterior, between the second and first vertebra and the occiput are the lacerti ligamentosi, transverse, oblique, or moderator, and middle or straight ligaments.

What are the ligaments of the pelvis? The anterior and posterior coccygeal, ilio-lumbar, sacro-spinous, sacro-iliac, posterior sacro-sciatic, anterior sacro-sciatic, obturator, anterior pubic and the sub or inter-pubic ligaments.

What are the ligaments at the posterior articulation of the ribs? The anterior or radiating, interarticular, two capsular for the head of each, and one where they are articulated with the transverse processes of the vertebræ, the internal transverse, the external transverse, and middle costo-transverse ligaments.

What are the ligaments of the anterior articulation of the ribs? There are two, an anterior, a posterior, and the costo-xiphoid ligaments; also a synovial membrane imperfectly developed.

What is meant by the articulation of the shoulder? It is the junction of the clavicle to the upper part of the sternum and first rib; of the scapula to the clavicle; and of the humerus to the scapula.

What are the ligaments and parts concerned in the articulations of the anterior end of the clavicle? The capsular and interclavicular ligaments; an interarticular cartilage; two synovial membranes; and the rhomboid ligament connecting the first rib with the clavicle.

What ligaments are concerned in the scapulo-clavicular articulations? The capsular, the coraco-clavicular which is divided into the conoid and trapezoid, bifid, coracoid, and the triangular ligaments or coraco-acromialis.

What ligaments are concerned in the scapulo-humeral articulation? The capsular, the long head of the biceps, coraco-humeral or ligamentum adscititum, and the glenoid ligament, which surrounds the glenoid cavity.

What are the ligaments of the elbow joint? The capsular, annular, external and internal lateral ligaments.

What ligaments are situated between the radius and ulna? The interosseous, the round ligaments and the capsular or sacciform at their lower extremities.

What are the ligaments of the wrist joint? The internal and external lateral, capsular, dorsal, and palmar ligaments.

What are the ligaments of the ilio-femoral or hip articulation? The cotoloyd, which tips the margin of the acetabulum, the inter-articular or round, and the capsular ligaments.

What are the ligaments of the knee joint? The capsular ligament, or involucrum generale, the ligament of the patella, a posterior, internal and external lateral, and two crucial ligaments. This joint has also two semi-lunar cartilages.

How are the tibia and fibula united together? They are united superiorly by an anterior and posterior ligament, and a synovial membrane. Inferiorly also by an anterior and posterior ligament; and the bodies of these bones are united by an interosseous ligament.

What are the ligaments of the ankle joint? An imperfect capsular, an internal and an external lateral ligament.

What ligaments connect the os astragalus and os calcis? The interosseous, posterior, and deltoid ligaments.

What connects the astragalus with the scaphoides? It is connected above by a broad thin ligament; below by two ligaments, internal and external calcaneo-scaphoid.

What connects the calcis with the cuboides? The superior and inferior calcaneo-cuboid ligaments.

Of the Integuments.

What is meant by the integuments of the body? The cellular and adipose substances, and the dermoid covering.

What are some of the properties of cellular tissue? It is an elementary tissue, generally disseminated over the whole body; found beneath the skin; between muscles; connecting membranes and other parts; entering into their composition; indispensible to their texture; and precedes them in the development of the fœtus. It is composed of cells which communicate freely with each other and may be distended either with air or other fluids, and from its elasticity when the distension is removed it will return to its original shape.

Where is the adipose structure found? Between the skin and the fascia, in the layers of condensed cellular substance, next to the muscles, as the face, neck, trunk of the body, buttocks, limbs, palms of the hands, soles of the feet, &c. In chemical composition it differs from all other parts of the body in containing no nitrogen. It is enclosed by cellular substance.

What is meant by the dermoid covering? The skin; its sebaceous organs; the nails; and the hair.

How many lamina does the skin consist of? Three; the cutis vera, the retemucosum, and the cuticula.

What is understood by the sebaceous organs? The follicles and glands which furnish the oily exhalation that lubricates the surface of the skin.

What are the nails? They may be considered as a continuation of the cuticle, supply its place on the extremities of the fingers and toes, and correspond with the talons and hoofs of animals. They are devoid of organization.

What are the hairs? They are cylindrical filaments found on most parts of the skin excepting the palms and soles.

Of Muscles.

What are the properties of muscles? They are the organs of motion, and are characterized by redness, softness, irritability, contractility, and by being formed of long, parallel fibres, which are arranged into fasciculi; each fibre extending the whole length of the muscle, considering the length as represented by the tendinous beginning on one hand, and the tendinous termination on the other.

How are they divided? Into voluntary and involuntary.

What is meant by the myotility of muscles? It is their power of contraction, elongation, and remaining fixed.

What does a muscle consist of? A belly and two extremities; the one that is fixed is called the head or origin, and the other is the tail or insertion. The belly or body is the fleshy part, and the extremities are tendinous. In the most simple muscles, the fibres run in the direction of their length. Those which run obliquely from a tendon or bone are called semi-pennati. Those which converge obliquely to a tendon in the centre are called pennati. Others again are formed of a congeries of smaller muscles, the fibres of which run in different directions and intermixed with tendinous matter, as the deltoid and subscapular.

Upon what does the strength of a muscle depend? Upon the number of its fibres; so that those whose fibres run obliquely are stronger than those which run longitudinally.

How are tendons distinguished? By their white and shining appearance; they have no elasticity or power of elongation or contraction; they have two general shapes funicular or like cords; and membraneous or resembling an aponeurosis.

Trunk.

Abdomen.

What is the origin, insertion, and use of the following muscles?

Obliquus externus. Origin, eight or nine inferior ribs. Insertion, ensiform cartilage, linea alba, pubis, Poupart's ligament, and anterior two-thirds of the crest of the ilium. Use, to compress the abdomen.

Obliquus internus. Origin, fascia lumborum, crest of ilium, and external third of Poupart's ligament. Insertion, in the cartilages of the seven inferior ribs, ensiform cartilage,

linea alba, symphysis, and upper edge of the pubis. Use, to bend the body and compress the abdomen.

Cremaster. Origin, Poupart's ligament and obliquus internus. Insertion, tunica vaginalis, testis, and scrotum.

Transversalis. Origin, fascia lumborum, crest of ilium, Poupart's ligament, and seven lower ribs. Insertion with the obliquus internus. Use, to compress the abdomen.

Rectus. Origin, pubis. Insertion, ensiform cartilage, and to the cartilages of the fifth and sixth ribs. Use, to bend the trunk, and compress the abdomen.

Pyrimidalis. Origin, pubis. Insertion, linea alba.

Diaphragm. The greater muscle .Origin, xiphoid cartilage, the cartilages of the last true and all the false ribs. Insertion, cordiform tendon.—The lesser muscle. Origin, the bodies of the four first lumbar vertebrae. Insertion, cordiform tendon.

Quadratus lumborum. Origin, spine of ilium. Insertion, transverse processes of lumbar vertebræ, and last dorsal, Use, to bend the trunk to one side and forwards.

Psoas muscles. Origin, the lumbar, and dorsal vertebrae. Insertion, cavity of the pelvis, and lesser trochanter.

Iliacus internus. Origin, transverse process of last lumbar vertebra, crest of ilium, and iliac fossa. Insertion with the psoas muscles into the femur. Use, to bend the thigh and body.

What are the muscles of the male perineum?

Sphincter ani, externus and internus, erector penis, accelerator urinae or ejaculator seminis, transversus perinei, levator ani, compressor urethrae, and coccygeus.

Back.

What is the origin, insertion, and use, of the following muscles?

Trapezius. Origin, occipital bone, ligamentum nuchae, last cervical, and the dorsal vertebrae. Insertion, clavicle, acromion process, spine of the scapula. Use, to draw the parts in the several directions of its fibres.

Latissimus dorsi. Origin, dorsal spines, fascia lumborum, sacrum, ilium, and three or four last ribs. Insertion, humerus. Use, to draw the os humeri downwards, and backwards.

Rhomboideus major and minor. Origin, ligamentum nuchae, and dorsal spines. Insertion, base of the scapula. Use, to draw the scapula up and back.

What other muscles are situated on the back? Levator anguli scapulae, splenius capitis, and colli, sacrolumbalis, longissimus dorsi, spinalis dorsi, musculi accessorii, cervicalis descendens, transversalis cervicis, trachelo mastoideus, complexus, semi-spinalis colli and dorsi, multifidus spinae, rectus capitus posticus major and minor, obliquus superior and inferior, interspinales, intertransversarii, and levatores costarum.

Thorax.

What is the origin, insertion, and use of the following muscles?

Pectoralis major. Origin, sternal half of clavicle, anterior surface of sternum, cartilages of the third, fourth, fifth, and sixth true ribs. Insertion, humerus, anterior edge of bicipital groove. Use, to draw the arm inwards, forwards, and to depress it.

Pectoralis minor. Origin, upper edge of fourth, fifth, and sixth ribs. Insertion, coracoid process of scapula. Use, to draw it in, and down.

Subclavius. Origin, first rib. Insertion, clavicle.

Serratus magnus. Origin, eight or nine superior ribs. Insertion, base of scapula. Use, to draw it forwards.

Intercostales external. Origin, eleven inferior ribs at their external, inferior edges. Insertion, superior edge of ribs beneath.

Internal. Origin, eleven ribs internally, from the lower edge of each. Insertion, inner lip of the rib beneath. Use, to draw the ribs together.

Triangularis sterni. Origin, lower part of sternum. Insertion, cartilages of fourth, fifth and sixth ribs. Use, to diminish the cavity of the thorax.

Neck.

What is the origin, insertion, and use of the platisma myoides? Origin, cellular membrane over deltoid and pectoral muscles, and from the clavicle. Insertion, chin and fascia of the lateral and inferior parts of the face. Use, to elevate the skin of the neck.

Sterno-cleido mastoideus. Origin, sternum and clavicle. Insertion mastoid process and transverse ridge of the occipital bone. Use, to draw the chin towards the sternum.

What other muscles are there of the neck, the names of which mostly indicate their attachment? Sterno-hyoideus,

sterno-thyroideus, thyreo-hyoideus, omo-hyoideus, mylo-hyoideus, stylo-hyoideus, stylo-glossus, stylo-pharyngeus, genio-hyoideus, longus colli, rectus capitis anticus major, minor, and lateralis, scalenius anticus, medius and posticus.

Head.

Face.

What is the origin, insertion and use of the occipito-frontalis? Origin, superior transverse ridge of the occipital bone and mastoid process. Insertion, integuments, and muscles of eyebrows. Use, to corrugate the forehead and elevate the supercilia.

Corrugator supercilii. Origin, internal angular process of os frontis. Insertion, middle of eyebrow. Use, to draw the lower part of the forehead into vertical wrinkles.

What are the other muscles of the face? Compressor naris, orbicularis palpebrarum, levator labii superioris et alæ nasi, levator anguli oris, zygomaticus major and minor, depressor labii superioris et alæ nasi, depressor anguli oris, depressor labii inferioris, levator menti et labii inferioris, buccinator, orbicularis oris.

Lower Jaw.

Temporalis. Origin, semicircular ridge on parietal bone, temporal fossa, and fascia. Insertion, coronoid process of lower jaw. Use, to pull it directly up.

Masseter. Origin, superior maxillary bone. Insertion, outer surface of angle of lower jaw.

Pterygoideus internus. Origin, internal side of external pterygoid plate. Insertion, inner side of angle of lower jaw. Use, to close the jaw and produce a grinding motion.

Pterygoideus externus. Origin, outer side of external pterygoid plate. Insertion, internal part of neck of lower jaw. Use, same as former.

Digastricus. Origin, groove at base of mastoid process. Insertion, inner side of base of jaw. Use, to open the mouth.

Upper Extremity.

Shoulder.

What is the origin, insertion, and use of the following muscles.?

Deltoides. Origin, lower edge of spine of scapula, acromion and outer third of clavicle. Insertion, humerus, near its middle. Use, to raise the arm.

Supra spinatus. Origin, scapula above its spine. Inser-

tion, great tuberosity of humerus. Use, to raise the arm and turn it out.

Infra spinatus. Origin, scapula, below the spine. Insertion, great tuberosity of humerus. Use, to roll the arm.

Teres minor. Origin, inferior costa. Insertion, great tuberosity of the humerus. Use, to rotate and draw the arm down and back.

Teres major. Origin, inferior angle of scapula. Insertion, inner edge of bicipital groove. Use, to rotate the arm inwards, and draw it back.

Subscapularis. Origin, subscapular fossa. Insertion, small tubercle of humerus. Use, to draw the arm down and roll it in.

Arm.

Biceps. Origin, coracoid process and edge of glenoid cavity. Insertion, tubercle of radius. Use, to flex the forearm.

Coraco Brachialis. Origin, coracoid process. Insertion, internal side of humerus near the middle. Use to draw the arm up and forward.

Brachialis internus. Origin, centre of humerus. Insertion, coranoid process of ulna. Use to flex the fore arm.

Triceps extensor cubiti. Origin, neck of scapula, outer side of humerus, ridge leading to internal condyle of humerus. Insertion, olecranon process. Use to extend the forearm.

Fore Arm.

What class of muscles take origin from the internal condyle and anterior part of ulna? The flexors and pronators,

What are the flexors and pronators? Pronator radii teres. flexor carpi radialis, palmarus longus, flexor carpi ulnaris.

Flexor digitorum sublimus perforatus. Origin inner condyle and radius. Insertion, second phalanx, Use, to bend the second phalanx.

Flexor digitorum profundus perforans. Origin, ulna, radius, and interosseous ligament. Insertion, last phalanx.

Flexor longus policis. Origin, radius. Insertion, last phalanx of thumb.

Pronator radii quadratus. Origin, anterior surface of ulna. Insertion, anterior part of radius.

What class of muscles take origin from the external condyle and posterior part of ulna? The supinators and extensors.

What are the supinators and extensors? Supinator radii

longus, extensor carpi radialis longior and brevior, extensor carpi ulnaris, extensor digitorum communis, supinator radii brevis, extensor ossis metacarpi pollicis manus, extensor minor pollicis manus, major pollicis manus, and indicator.

Inferior Extremity.

Thigh.

What is the origin, insertion, and use of the following muscles?

Tensor vaginæ femoris. Origin, ilium. Insertion, fascia lata.

Sartorius. Origin, anterior superior spinous process of ilium. Insertion, upper end of tibia. Use, to bend the leg and draw it obliquely in.

Rectus femoris. Origin, anterior inferior spinous process and margin of acetabulum. Insertion, patella.

Vastus externus. Origin, below trochanter major and outer edge of linea aspira. Insertion, unites with rectus.

Vastus internus. Origin, on a level with trochanter minor and from inner edge of linea aspira. Insertion, unites with rectus.

Cruraeus. Origin, anterior and external part of femoris. Insertion, unites with rectus. Use of these four to extend the leg.

Gracilis. Origin, symphysis and descending ramus of the pubis. Insertion, internal surface of tibia. Use, to flex the leg.

Pectineus. Origin, horizontal portion of pubis. Insertion, upper part of linea aspera. Use, to draw the thigh inwards and forwards.

Adductor longus. Origin, anterior surface of pubis. Insertion, middle third of linea aspera.

Adductor brevis. Origin, anterior inferior surface of pubis. Insertion, superior third of linea aspera.

Adductor magnus. Origin, descending ramus of pubis, ramus and tuberosity of the ischium. Insertion, internal condyle and ridge leading to linea aspera. Use, these three muscles draw the thigh inwards.

Gluteus maximus. Origin, posterior third of spine of ilium, sacrum, os coccygis, and sacro sciatic ligament. Insertion, between trochanter and linea aspera, linea aspera and fascia lata. Use, to draw the thigh back and keep the trunk erect.

Gluteus medius. Origin, spine of ilium and dorsum. Insertion, great trochanter. Use, to draw the thigh back and out.

Gluteus minimus. Origin, dorsum of ilium. Insertion, great trochanter. Use, to abduct the thigh and rotate the limb inwards.

Pyriformis. Origin, sacrum, sciatic ligament, and ilium. Insertion, root of trochanter major. Use, to rotate the limb in.

Gemini. Origin, one from root of the spine of ischium, the other from tuberosity. Insertion, root of trochanter major. Use, to rotate the limb in.

Obturator internus. Origin, pelvic margin of foramen thyroideum, its membrane and plane of the ischium. Insertion, fossa of trochanter. Use, to rotate the limb out.

Quadratus femoris. Origin, tuber ischii. Insertion, great trochanter and line leading to the lesser. Use to rotate the limb out.

Obturator externus. Origin, obturator ligament. Insertion, fossa at root of trochanter. Use, to rotate the thigh out.

Biceps flexor cruris. Origin, long head, tuber ischii; short head, linea aspera low down. Insertion, head of fibula. Use, to flex the leg.

Semi-tendinosus. Origin, tuber ischii. Insertion, tibia. Use, to flex the leg.

Semi-membranosus. Origin, tuber ischii. Insertion, external condyle of femur, and heads of tibia and fibula. Use, to flex the leg.

Leg.

Tibialis anticus. Origin, head and spine of tibia, interosseous ligament. Insertion, great cuneiform bone and first metatarsal. Use to present the sole obliquely in.

Extensor longus digitorum pedis. Origin, heads of tibia fibula, and interosseous ligament. Insertion, last phalanx of the four external toes. Use, to extend the toes.

Peroneus tertius. Origin, fibula. Insertion, metatarsal bone of little toe. Use, to bend the foot.

Extensor proprius pollicis pedis. Origin, middle third of fibula and tibia. Insertion, second phalanx of great toe. Use, to extend it.

Peroneus longus. Origin, head of fibula and tibia. insertion, metatarsal bone of great toe and internal cuneiform. Use, to extend the foot and incline the sole outwards.

Peroneus brevis. Origin, lower half of fibula. Insertion, base of metatarsal bone of little toe and cuboid bone.

Gastrocnemius. Origin, upper and back part of condyle of femur and ridge above it. Insertion, os calcis.

Soleus. Origin, external head from superior third of fibula; internal head, middle third of tibia, unites with the above and forms the tendo-Achillis. Insertion, os calcis Use, to extend the foot.

Plantaris. Origin, back part of femur. Insertion, os calcis.

Popliteus. Origin, depression on outer condyle. Insertion, upper part of tibia.

Flexor longus digitorum pedis perforans. Origin, flat surface of tibia, fascia, &c. Insertion, last phalanx of four lesser toes.

Flexor longus pollicis pedis. Origin, inferior part of fibula. Insertion, last phalanx of great toe.

Tibialis posticus. Origin, tibia, fibula, and ligament. Insertion, os naviculare. Use, to extend the foot, and present the sole inwards.

Organs of Digestion.

What are the organs of digestion? The organs of digestion consist in an uninterrupted canal extending from the lips to the anus, and of numerous glandular bodies placed along its course. This canal, called alimentary, is divided into three portions, the superior, middle and inferior. The superior is composed of the mouth, pharynx, and œsophagus; the middle of the stomach and small intestine; the inferior of the large intestine. The glandular bodies are the salivary glands, pancreas, liver, spleen, and a large number of muciparous glands extending along the whole course of the canal.

Teeth.

What are the characteristics of the teeth? They are the hardest portions of the body, bear an analogy to bone. The greater part of their length is implanted into the alveolar processes of the jaws; this part is called the root; beyond this is a portion embraced by the gum called the neck; and the free or projecting part is the body or corona.

What is the number of teeth in the adult? Thirty-two; sixteen in each jaw, and are classified from their shape into eight incisors, four cuspated, eight bi-cuspated, and twelve molar.

Of what are teeth composed? They are composed of two substances, one, of which, is ivory, or bone like, and the other enamel. The enamel forms the periphery of the body of a tooth, as is known by its whiteness, brittleness, semi-transparency and hardness. It is fibrous and the fibres are placed so as to pass from the surface towards the centre of the tooth, so that the friction is applied against their extremities. Its composition is principally phosphate of lime with a small portion of gelatin. The osseous portion is the most abundant; it forms the root, neck, and body, except the crust of enamel on its periphery. Internally there is a cavity filled with a soft pulpy matter which receives an artery, a vein, and a nerve.

The arteries of the teeth of the upper jaw come from the alveolar and infra orbitar; and the nerves from the second branch of the fifth pair; the arteries of the lower teeth come from internal maxillary, and the nerves from the third branch of the fifth pair.

What is understood by deciduous teeth? They are teeth peculiar to infants, and are twenty in number, ten in each jaw; on either side are two incisors, one cuspidatus, and two molares. Some of them fall out about the seventh year and all of them by the fourteenth. The order of their appearance is as follows:—

Two central incisors, from the sixth to the eighth month.

Two lateral incisors, from the seventh to the tenth month.

The first molar on each side, from the twelfth to the fourteenth month.

The cuspated, from the fifteenth to the twentieth month.

The second molar, from the twentieth to the thirtieth month.

At birth there are the rudiments of fifty-two teeth in the two jaws; twenty deciduous and thirty-two permanent.

How are the deciduous teeth removed? By the absorption of the roots.

Tongue.

Where is the tongue situated? It extends from the os hyoides posteriorly to the incisor teeth anteriorly. It is divided into base, body, and tip.

What muscles compose the tongue? The stylo-glossus, hyo-glossus, genio-hyo-glossus and lingualis form the principal bulk; besides these there are the superficial lingual

muscle, transverse lingual muscles, and the vertical lingual muscles, which are small fibres running in different directions as their names indicate.

How are the papillæ of the tongue divided? Into papillæ maximæ or capitatæ, mediæ, villosæ, and filiformes; and occupy the anterior two thirds of this organ.

The tongue is supplied with arteries principally from the lingual branch of the carotid; and with nerves from the hypo-glossal, the fifth pair, and the glosso-pharyngeal.

Palate.

What composes the palate? It is composed anteriorly by the palatine processes of the superior maxillary and palatine bones, covered by the lining membrane of the mouth below, and pituitary membrane above; posteriorly is a membranous portion called the soft palate, which has an oblong shape and continued from the hard palate posteriorly; in its centre is the uvula from which proceeds the two crescentric doublings called the lateral half arches which are divided into anterior and posterior. In the depressions between these is the tonsil gland. The space bounded in front, and behind, by these lateral half arches is the fauces; and the anterior opening into it is the isthmus of the fauces.

The muscles of the palate are the constrictor isthmi faucium, palato-pharyngeus, circumflexus, or tensor palati, levator palati, and azygos uvula.

Glands.

How are the glands of the mouth divided? Into muciparous and salivary.

What are the muciparous glands? They are the labial, buccal, lingual, palatine, and the tonsils.

What are the salivary glands? The parotid, its excretory duct is called the duct of Steno; it is the size of a crow quill, and opens opposite to the second large molar tooth of the upper jaw; the submaxillary, its duct is called the duct of Wharton; and the sublingual, its duct is called ductus Riviniani.

Pharynx.

What are the characteristics of the pharynx? It is a large membranous cavity, situated between the cervical vertebrae and posterior part of the nose and mouth, and extends from

the base of the cranium to the lower part of the cricoid cartilage, and fifth cervical vertebra, where it is continued into the œsophagus. It consists of three coats; the external or muscular, is composed of three muscles on each side, one above the other,—a cellular, intermediate; and an internal, or mucous coat. The muscles forming the muscular coat are the constrictors inferior, medius, and superior. The arteries which supply it, are the superior, and inferior pharyngeal on each side.

What are the characteristics of the œsophagus? It is a tube continuous with the pharynx, in front of the spine, behind the trachea, ten or twelve lines in diameter, and increases in size from above downwards. In the thorax it passes down in the posterior mediastinum, with the aorta on the left, and the vena azygos on the right. It has three coats, the muscular, cellular, and mucous, and is united to adjacent parts by loose cellular substance. The muscular coat consists of two lamina, the longitudinal and the circular. Its arteries are derived from the inferior thyroid, the thoracic aorta, and the gastric.

Abdomen.

How is the abdomen bounded? Inferiorly by the iliaci interni, the psoae, and levator ani muscles; on the front and sides by the five pairs of abdominal muscles, posteriorly by the lesser muscle of the diaphragm, quadrati lumborum, the lumbar vertebrae, and the sacrum.

How many kinds of viscera are contained in the cavity of the abdomen? Three: one is engaged in digestion and assimilation, another in the secretion and excretion of urine, and the third in generation.

How is the abdomen divided? Into arbitrary regions: consider a line or plane as extending across the abdomen about two inches below the umbilicus from the superior part of the crista of one ilium to the corresponding point of the other side. Draw on each side a line perpendicular to the first by commencing at the anterior inferior spinous process of the ilium, and carry it up to the diaphragm: then extend a fourth line across the abdomen parallel with the first and intersecting the two last where they strike the cartilages of the ribs. It is seen that these four lines or planes, with the assistance of the parieties of the abdomen, furnish nine regions. The central one above is called the epigastric,

and the lateral the right and left hypochondriac. The central in the middle is the umbilical, and the lateral, the right and left lumbar. The central below is the hypogastric, and the lateral the right and left iliac. The scrobiculus cordis, or pit of the stomach, is the hollow in the epigastric region. The regio pubis is the region for two inches around the symphisis pubis. These two last are termed subordinate divisions.

What position relative to these regions does the liver occupy? Nearly the whole of the right hypochondriac; the upper half of the epigastric; and the right superior part of the left hypochondriac.

Where is the spleen situated? In the posterior part of the left hypochondriac region.

Where is the stomach situated? Moderately distended it occupies the lower half of the epigastric region and the right inferior portion of the left hypochondriac.

Where is the small intestine situated? Moderately distended by flatus, it occupies the umbilical region, the hypogastric, portions of the iliac on each side, and also the upper part of the cavity of the pelvis, when its viscera are empty.

Where is the large intestine situated? It begins in the right iliac region, ascends through the right lumbar and right hypochondriac, passes into the lower part of the epigastric, or upper part of the umbilical, according to the state of distension of the stomach, thence into the left hypochondriac, left lumbar, and left iliac, passes into the pelvis, and descending in front of the sacrum, terminates in the anus.

Where is the pancreas situated? Transversely in the lower back part of the epigastric region, extending from the left hypochondriac to the right side of the spine, and is placed behind the stomach which covers it.

Where are the kidneys, and capsulae renales situated? In the posterior part of the lumbar regions on each side of the spine.

Where are the urinary bladder, and rectum situated? In the cavity of the pelvis, and between them in the female is the uterus, ovaries, and vagina.

What is understood by the peritoneum? It is a serous membrane lining the abdomen and reflected over the periphery of nearly all the viscera. It is a complete sac, with no opening into it, except in the female through the fallopian tubes.

What are the processes of the peritoneum? There are four, and are known by the general name of omentum, epiploon, or caul. They are called omentum minus or hepatico gastricum, omentum majus or gastro colicum, omentum colicum, and the omentum gastro-splenicum.

What are the characteristics of serous membranes? They are thin, transparent, and white, resemble compressed cellular membrane, invariably assume the form of perfect sacs; are distinct one from another, and secrete a serous fluid for the lubrication of their internal surfaces.

Chlypoietic Viscera.

Stomach.

What are the characteristics of the stomach? It is a hollow viscus, situated in the epigastric region, of a conoidal shape, curved upwards, and presents two faces, two orifices, two curvatures, and two extremities. The faces are called anterior and posterior. The orifices are named cardiac and pyloric. The curvatures are the great and small, or upper and lower. It has four coats or laminae, viz: peritoneal, muscular, cellular, and mucous. Its muscular coat is collected into fasciculi, and pass in three directions, longitudinal, circular, and oblique. The glands of Brunner are situated near the cardiac and pyloric orifices. It is very vascular; its arteries being branches of the coelic, are the gastric, right and left gastro epiploic, and the vasa brevia. The first to the lesser curvature; the second and third along the great curvature; and the last, from four to six in number, to its great cul-de-sac. The veins terminate in the vena portarum. Its nerves come from the par vagum, and the semilunar ganglion of the sympathetic.

Intestines.

What is the length of the intestinal canal from the pylorus to the anus? From thirty to thirty-five feet; and is divided by anatomists into the small, and large intestine.

What are the characteristics of the small intestine? It commences at the pylorus and terminates in the right iliac region by a lateral aperture in the large intestine. It is four-fifths of the length of the whole canal being from twenty-four to twenty-eight feet, cylindrical; the upper end is larger than the lower, decreasing gradually as you proceed downwards. It has four coats like the stomach, which

have the same names. The course of its muscular fibres are longitudinal and circular. Its mucous coat is thrown into folds or duplicatures, called valvulæ conniventes, in the direction of the circumference, and are segments of circles.

On this coat are numerous small projections, called villi, hence it is sometimes termed villous coat. Each villus is composed of an artery, vein, and lymphatic. Its mucous glands are situated in the cellular coat, between the muscular and mucous, and their ducts open on the surface of the latter. They are solitary and aggregated; the former are glandulæ solitariæ or Brunneri, and are found principally in the duodenum, and upper portion of the small intestine; the latter are called glandulæ agminatæ or Peyeri, and exist in the lower part of the small intestine.

How is the small intestine divided? Into duodenum, jejunum, and ileum; the latter two have no mark of distinction, and are sometimes called the mesenteric portion. The duodenum is about twelve inches long, and is the commencement of this canal. The upper two-fifths below the duodenum, is called the jejunum, and the lower three-fifths the ileum.

What is the mesentery? It is a process of peritoneum which serves to connect the small intestines to the posterior parietes of the abdomen, and extends from the left side of the second lumbar vertebra to the right iliac fossa; this attachment is called the root, and is about six inches long. Its lamina contains the superior mesenteric artery and vein, lymphatic or lacteal glands and vessels, ramifications, from the solar plexus of the sympathetic nerves, and cellular, and adipose tissue.

What are the characteristics of the large intestine? It exceeds in diameter the small, and receives the effete matter therefrom. It is not so regularly cylindrical, the surface is arranged into three series or longitudinal rows of projections, separated by transverse depressions. It commences at the inferior end of the small intestine, and terminates at the anus. It is divided into three parts; the commencement, below the insertion of the ileum, about two inches in length, is called the cœcum, or caput coli; the remaining portion, until it reaches the pelvis, is called the colon, when it takes the name of rectum.

What is meant by mesocolon? A duplication of perito-

neum, which fixes the large intestine to the posterior parieties of the abdomen.

How many coats has the large intestine? Four; bearing the same name as those of the small intestine. The peritoneal coat has small duplicatures containing fat, and called appendices epiploicæ; the muscular coat has two layers of fibres, the longitudinal, and transverse or circular; the mucous coat has but few villi, but its muciparous glands and follicles are very numerous.

Where is the ileo-colic valve? At the junction of the ileum and caput coli or cœcum.

What is meant by mesorectum? It is that duplicature of peritoneum which attaches the rectum to the sacrum.

From what is the large intestine supplied with blood? A part of the superior mesenteric, the whole of the inferior mesenteric, and the internal pudic arteries; the veins empty into the vena portarum; the nerves are derived from the solar and hypogastric plexus of the sympathetic.

What are the characteristics of mucous membranes? They line the internal surfaces of the hollow viscera, and form an internal tegument to the body, analagous to the skin. They are of a soft, spongy consistence; easily yield to mechanical violence, and are dependent upon the surrounding cellular coat for their strength.

Assistant Chylopoietic Viscera.

What are the characteristics of the liver? It secretes the bile, and is the largest gland in the human body. Its whole superior face is in contact with the diaphragm, on the left is the spleen, below are the stomach and transverse colon, and behind are the vertebræ and ascending cava. It is about ten inches in length, six or seven wide, and weighs in the adult four to five pounds. It is divided into lobes, called right and left. The former is the larger, and has elevations on its surface, called lobulus spigelii, and lobulus quartus.

What are the ligaments of the liver? The falciform or suspensory, the ligamentum teres, the right lateral, the left lateral, and some anatomists give the name of coronary to that duplicature of peritoneum, at the junction of the suspensory and lateral ligaments. The liver has also a proper coat connecting it with the peritoneum.

What are the blood vessels? They are of three kinds: the vena portarum, the hepatic artery, and the hepatic veins.

What composes it? Acini, or granulations, each of which is complete in itself, having the above named blood vessels, the origin of a branch of the hepatic duct, called porus biliarius, lymphatic vessels, and nerves.

What is the capsule of Glisson? It is a condensed cellular fibrous tissue, at the bottom of the transverse fissure of the liver, which invests the vena portarum, hepatic artery, and biliary ducts, and follows them throughout the substance of the liver.

What are the characteristics of the gall bladder? It is a reservoir for the bile, fixed on the under surface of the great lobe of the liver, to the right of the umbilical fissure; its shape is an oblong pyriform sac. It has three coats, a peritoneal, a cellular, and a mucous. Its artery is a branch of the hepatic.; its veins empty into the vena portarum, and its nerves come from the sympathetic. Its duct, called cystic, unites at an acute angle with the hepatic duct, and forms the ductus communus choledochus; these ducts have two coats, an external, fibrous lamellated and extensible, and a mucous.

What are the characteristics of the spleen? It is in the posterior part of the left hypochondriac region, bounded above by the diaphragm, below by the colon, on the right by the great end of the stomach, and the pancreas. Its color varies from deep blue to dark brown; it is usually about four and a half inches long by two and a half wide. Its artery called splenic, is a branch of the cœlic, its vein empties into the vena portarum, and its nerves are derived from the solar plexus. It has no excretory duct, and its use is not ascertained.

What are the characteristics of the pancreas? It is fixed in the lower and back part of the epigastric region; bounded in front by the stomach which conceals it, and is between the two laminae of the mesocolon, about six or seven inches long, two wide, and flattened before and behind; its right extremity is enlarged into a head or tuber, sometimes called the lesser pancreas. It is of a light grey, or pink color, and consists of lobules. The arteries which supply it, come principally from the splenic; the veins empty into the splenic; and the nerves come from the solar plexus. It

secretes a salivary fluid and is the largest of this class of glands. Its excretory duct is called ductus Wirsungii, which either penetrates the ductus communus choledochus, or the duodenum, very close to it.

Urinary Organs.

What are the urinary organs? The kidneys, renal capsules, bladder, and urethra.

What are the characteristics of the kidneys? They are two glandular bodies for the secretion of urine, situated on either side of the spine, extending from the upper margin of the eleventh dorsal to the lower margin of the second lumbar vertebra; the right is ten or twelve lines lower than the left, they are hard, solid, of a brown color, a compressed ovoidal shape, excavated on the margin, which is applied to the spine, and resemble the common kidney bean; they are about four inches long, and two wide, and weigh each three or four ounces, have no peritoneal coat, but have a well marked capsule; the arteries are called the renal or emulgent and are branches of the aorta; the veins take the same name as the arteries, and are equal to them in number. The substance of the kidneys is divided into cortical, and medullary, or tubular.

The cortical, or secretory substance forms the circumference, and is on an average about two lines in thickness.

The tubular portion consists in from twelve to eighteen conoidal fasciculi called the pyramids of Malpighi, with their bases towards the cortical portion; their apices converge towards the centre, are free, and project so as to form the papillæ renales. Each fasciculi or cone, is composed of a collection of tubes, called tubuli uriniferi.

What composes the excretory duct of the kidney? The ureter, which commences in the centre of the kidney, by an enlargement called pelvis; this branches off superiorly, into three or four portions called calices, one above, one below, and one or two intermediate. Each of these calices is divided at its free extremity into three or four short funnel shaped terminations, called infundibula. These terminations embrace each by its expanded orifice, the base of a papilla, so as to permit the latter to project into it, and distil its urine there. The pelvis of the kidney as it emerges from the fissure becomes reduced to a cylindrical canal, which is properly the ureter; it is about the size of a goose quill,

descends into the pelvis, and penetrates obliquely the coats of the bladder, ten or twelve lines behind its neck, and is composed of two coats or lamina.

What are the renal capsules? They are two small bodies, one on either side, placed upon the upper end of the kidney, of a yellowish brown color tinged with red, have no excretory ducts, and are the most distinctly developed in the fœtus.

What are the characteristics of the bladder? It is the reservoir for the urine, placed in the pelvis just behind the symphysis of the pubes. The superior end is called the upper fundus; the lower end the inferior fundus; and between the two is the body; the neck is its place of junction with the urethra. It consists of four coats; the peritoneal, muscular, cellular, and mucous. The internal face of the mucous coat presents at its inferior part the vesical triangle, behind and below the neck, occupying the space between it and the orifices of the ureters. The uvula vesicæ is at the anterior angle of the triangle, which sometimes presents an obstruction to the introduction of the catheter.

Organs of Generation in the Male.

What does the male organs of generation consist of? The testicles, and the penis, with their appendages.

How is the penis formed? By common integuments, cellular tissue, the corpora cavernosa, and the corpus spongiosum urethrae.

What are the characteristics of the urethra? It is a canal whose length varies, and extends from the neck of the bladder to the extremity of the glans penis. The first part penetrates the prostate gland, and is called the prostatic portion, on its inferior surface is a doubling, which constitutes the verumontanum or caput gallinaginis. Between the prostate and the bulb is the membranous portion, about eight or ten lines long; this canal varies in its dimensions in different parts.

What are the characteristics of the vesicula seminalis? They are two convoluted tubes, one on each side, two inches in length, placed on the lower fundus of the bladder between it and the rectum, and behind the prostate gland; they are composed of two coats. The excretory duct of each vesicle is about a line and a half long, when it joins with the vas deferens of the same side; a common canal is formed called

ductus ejaculatorius, which is eight or ten lines long, runs parallel with its fellow, and opens at the lateral anterior face of the caput gallinaginis.

What are the characteristics of the prostate gland? It is a body about the size of a horse-chestnut, fixed on the neck of the bladder, and penetrated by the urethra.

What is the situation of Cowper's glands? They are two in number, one on each side, situated in advance of the prostate, between the laminae of the triangular ligament.

What are the characteristics or the testicles? They are two in number, one on each side of the scrotum, of an oblong form, compressed laterally, an inch and a half long, one inch in breadth, eight or ten lines in thickness, and enveloped by the scrotum, dartos, tunica vaginalis, and tunica albuginea.

The scrotum is a continuation of the common skin, common to both testicles, symmetrical, and divided by a middle line, called raphe.

The dartos is within the scrotum,and forms two sacs, one for each testicle.

The tunica vaginalis is rigidly comparable to a double night-cap, one portion adhering firmly to the tunica albuginea beneath, and the other loosely reflected over the testicle.

The tunica albuginea is the proper coat of the testicle, and is in immediate contact with it; it is dense, strong, white, and fibrous.

The glandular portion of the testicles consist of a congeries of convoluted tubes called tubuli seminiferi, amounting to three hundred in number, and each nearly seventeen and a half feet in length, forming hanks held together by cellular substance.

The vasa recta are terminations of the tubuli seminiferi, which unite near the centre of the testicle in a complicated arrangement, called rete vasculosum testis

The vasa efferentia, (from twelve to eighteen ducts,) proceed from the rete vasculosum testis, and penetrate the corpus highmorianum and tunica albuginea. Each one is then convoluted upon itself into a conical body, the conus vasculosus. Each cone, at its base, has its tube entering successively into the tube of which the epididymis is formed.

The epididymis is formed of a single convoluted tube of the fourth of a line in diameter; at the lower end it becomes

less convoluted, turns upwards, and obtains the name of vas deferens.

What forms the spermatic cord? It is a fasciculus of about half an inch in diameter, and may be felt passing from the upper end of the testicle to the abdominal ring. It is formed by the vas deferens, spermatic artery, and veins, lymphatics of the testicle, and the nerves; covered by a cellular substance called tunica vaginalis communis, and the cremaster muscle.

The cremaster muscle is derived from the internal oblique and transversalis, completely envelopes the chord and draws the testicle upwards. The vas deferens is the proper excretory duct of the testicle, it is a white tube, about a line and a half in diameter, and has a cartilaginous feel; from the internal abdominal ring, it dips down into the pelvis by the side of the bladder, and terminates in the urethra, after uniting with the duct from the vesicula seminalis; this common duct is called the ductus ejaculatorius.

What are the fasciæ and muscles of the perineum? Perineal fascia, the triangular ligament of the urethra, and the pelvic fascia. The muscles are the erector penis, accelerator urinæ, transversus perinei, sphincter ani, coccygeus, and levator ani.

Female Organs of Generation.

What are the organs of generation in the female? The vulva, vagina, uterus, and the ovaria.

What constitutes the vulva? The vulva consists in the mons veneris, the labia externa, the labia interna, the clitoris, the vestibulum, the orificum urethræ, the fourchette, and the fossa navicularis.

What are the characteristics of the vagina? It is a thin membranous canal, leading from the vulva to the uterus, from four to six inches in length, between the bladder in front and the rectum behind, flattened, so as to bring its anterior and posterior surfaces in contact, has two tunics, a fibrous, and a mucous. At its anterior end is the corpus spongiosum vaginae, or plexus retiformis. The sphincter vagina muscle surrounds its anterior orifice.

The hymen is placed at the anterior orifice, for the purpose of closing it more or less perfectly.

What are the characteristics of the uterus? It is a compressed pyriform body, two and a half inches long, and one

and a half in diameter at its widest part. Its posterior face convex, anterior nearly flat, about one inch in thickness, and divided into fundus, body, and neck. The fundus is the part between the fallopian tubes at the superior extremity, the neck is the lower cylindrical portion, and the body is the part intermediate to the two. Its cavity is triangular, with the sides convex, and the inferior angle presents towards the opening into the vagina, called os tincæ. The mucous glands or lacunæ, in the neck, are called ovula Nabothi. Its structure is composed of longitudinal, circular, and oblique fibres.

What are the ligaments of the uterus? The broad or lateral, the anterior, the posterior, and round ligaments.

What are the Fallopian tubes? They are two membranous canals, one on each side, in the superior part of the broad ligaments of the uterus, four inches long, extend from the upper angle of the uterine cavity to the side of the pelvis, where their extremities are loose and expanded into a trumpet shaped mouth.

What are the characteristics of the ovaries? They are two in number, one on each side, situated on the posterior face of the broad ligament, of a compressed ovoid shape, about half the size of the male testicle. They have two coats, a peritoneal, and the tunica albuginea, which corresponds with the same coat of the testicle.

From whence do the female organs of generation derive their blood vessels and nerves? Principally from the internal pudic and other branches of the hypogastric arteries; their veins run into the hypogastric; and their nerves come from the sacral, and hypogastric plexuses.

Organs of Respiration.

What are the organs of respiration? The larynx, trachea, and lungs.

Larynx.

What are the characteristics of the larynx? It is an irregular cartilaginous tube, forming the upper part of the wind pipe; it is below the os hyoides and root of the tongue, bounded behind by the pharynx, and laterally by the primitive carotid arteries and internal jugular veins, and contributes essentially to the formation of the voice.

Five distinct cartilages enter into its structure; they are one thyroid, one cricoid, one epiglottis, and two arytenoid.

The thyroid is the largest, and forms the prominence in the upper part of the neck, called pomum Adami. It has two processes on each side; one called cornu majus and the other cornu minus.

The cricoid is below the thyroid, forms the base of the larynx, and articulates with the trachea.

The arytenoid cartilages resemble triangular pyramids curved backwards, are about six lines long, and are placed on the upper margin of the cricoid cartilage behind.

The epiglottis is situated on the posterior face of the base of the os hyoides; its general shape is that of an oval disk.

The ligaments of the larynx are the crico-thyroid, the middle thyreo-hyoid, the lateral thyreo-hyoid, and the thyreo-arytenoid two in number on each side of the larynx, one above the other, three lines apart. These ligaments also have the name of ligamentum vocale, and the portion of the larynx which is formed by them, and the pouches between them which are called the ventricles of Galen, is the structure essential to the formation of voice. The opening between the two lower ligaments is called the rima glottidis; and the space between the upper ligaments and the duplicature passing from the arytenoid to the epiglottis, is called glottis.

The muscles of the larynx are the thyreo-hyoideus, crico-thyroideus, crico-arytenoideus posticus, and lateralis, thyreo-arytenoideus, arytenoideus-obliquus, and transversus, thyreo-epiglottideus, and aryteno-epiglottideus.

The nerves of the larynx come principally from the superior and inferior laryngeal branches of the par vagum.

Trachea.

What are the characteristics of the trachea? It is a cylindrical canal four or five inches long, and nine lines in diameter; it opens into the larynx above, and terminates in the thorax opposite to the third dorsal vertebra, by two branches called bronchiæ. The structures which enter into the composition of the trachea are cartilage, ligamentous fibre, muscle, and mucous membrane.

The cartilage preserves the shape, and consists of from sixteen to twenty distinct rings, which are deficient at their posterior third.

The ligamentous structure exists between the proximate margins of the rings, and fills up the intervals between them so as to render the tube perfect. The deficiency in the rings

posteriorly, is supplied in part by condensed cellular substance.

The muscular structure exists at the cartilaginous deficiency in the posterior third; the fibres pass in a transverse direction between the interrupted extremities of the rings; it is between the condensed cellular substance and the mucous membrane of the trachea.

The mucous membrane lines the whole internal portion, from the larynx to the bronchiæ, throughout all their ramifications.

Where is the thyroid gland situated? It is placed on the first and second rings of the trachea, and on the sides of the larynx united in the centre by its isthmus.

Where is the thymus gland situated? Between the trachea and upper extremity of the sternum.

Lungs.

What are the characteristics of the lungs? They are essentially the seat of the process of respiration, and occupy nearly the whole cavity of the thorax. They are two bodies of a greyish pink color, separated by the heart and its great vessels, and each forms an irregular cone with the apex above.

The right lung is divided into three lobes, and the left into two. Each lobe is divided into distinct lobules, united by cellular tissue. The lobules are subdivided into fine air cells; these cells communicate laterally in the individual lobules, but not with the cells of different lobules. Each lobule has a ramification of the bronchial tube sent to it.

The blood vessels are of two kinds; the pulmonary, and bronchial. The former is for the æration of the blood, and the other for the nourishment of the lungs.

The nerves come from the par vagum and sympathetic.

What composes the root of the lungs? The root of each lung is formed by the pulmonary artery, and two veins, the nerves, bronchiae, lymphatic vessels, and glands, covered by the pleura, where it extends from the lungs to the pericardium

Pleura.

What is the arrangement of the pleura? They are two in number, afford a perfect covering for each lung, and are reflected over the adjacent sides of the pericardium, and the interior periphery of the thorax.

That portion of the pleura which covers the lung, is called pleura pulmonalis, and that which lines the thorax is the pleura costalis. They receive blood from the bronchial and intercostal arteries, and nerves from the intercostals.

The pleurae divide the thorax vertically, into two parts; this septum is called mediastinum, and contains the heart, with its coverings, and great vessels. The mediastinum is divided into three portions. The anterior passes from the front of the pericardium to the posterior face of the middle line of the sternum. The posterior passes from the posterior face of the pericardium to the dorsal vertebrae. The superior is within the circuit of the first ribs.

What is contained in the posterior mediastinum? The thoracic aorta, the œsophagus, the vena azygos, the thoracic duct, and the par vagum nerve of both sides.

What is contained in the superior mediastinum? A part of the remains of the thymus gland, descending vena cava, transverse vein, or vena innominata, the top of the arch of the aorta, arteria innominata, left carotid, left subclavian, trachea, œsophagus, phrenic nerve, and par vagum.

Circulating System.

What is the apparatus by which the circulation is effected? The heart, which in man consists of four cavities, the arteries, veins, and capillaries.

What is the course and description of the circulation? The blood, after getting to the right auricle, is emptied by its contraction into the right ventricle, from which it is forced through the branches of the pulmonary artery into the lungs. It is returned through the four pulmonary veins to the left auricle of the heart, which contracts and throws the blood into the left ventricle, from which it is propelled by its contraction, into the aorta; it is then distributed to the whole body by its small branches, from which it is collected by corresponding veins, into the ascending, and descending cava, that empty into the right auricle. It will, therefore, be seen that there are two circulations, the greater or systemic, the arteries of which contain red blood, and the veins dark or venous blood; and the lesser or pulmonic, the arteries of which contain dark blood, and the veins red or vivified blood.

What is meant by the capillaries? They are the extreme vascular ramifications which form the connexion between the arteries and veins.

Of how many coats are the arteries composed? Three: an external, a middle, and an internal coat.

The external or cellular coat is condensed cellular substance, formed into a cylinder, the fibres of which run in every direction.

The middle coat, called also muscular, proper, or tendi-

nous, is of a light yellow tinge, the fibres of which are circular, and possess elasticity.

The internal coat is sometimes called nervous and arachnoid.

Cellular substance, vessels, and nerves, also enter into the structure of arteries. The blood vessels which nourish the arteries are called vasa arteriarum.

Of how many coats are the veins composed? Three: an external, a middle, and an internal coat, analagous to the corresponding coats of the arteries, but more delicate in their texture.

What are the different parts of the blood called? Serum, crassamentum, and red globules.

Heart.

Where is the heart situated? In the thorax between the sternum and spine, having the lungs on either side, and the tendinous centre of the diaphragm below.

It is surrounded by its proper membrane, the pericardium; its weight is about six ounces, greatest length about five and a half inches, and its base about three and a half inches in diameter. It is divided into four cavities; two of which are called auricles, and two ventricles; the auricles form the base of the heart, and the ventricles its body. The right auricle and ventricle form the right side of the heart, and the left auricle and ventricle forms the left side.

What are the characteristics of the right auricle? It is an oblong cuboidal cavity, joined at its posterior superior angle by the descending vena cava, and at its posterior inferior angle by the ascending cava. In front it is dilated into a pouch called sinus, the upper extremity of which is elongated into a process with indented edges, called auricle, or auricular portion. On the septum between the auricles is the fossa ovalis, which is surrounded by its annulus, or the isthmus of Vieussens; below the fossa ovalis is the Eustachian valve. At the orifice of the large coronary vein is the valvular Thebesii. The opening into the right ventricle is the ostium venosum. In this auricle are fasciculi of muscular fibres called musculi pectinati.

What are the characteristics of the right ventricle? It is of the form of a triangular pyramid, forms the greater part of the anterior surface of the heart, and is about three lines in thickness. Its internal surface is covered by muscular

fasciculi called columnae carneae; from some of these, small tendinous chords are sent to the valves, called chordae tendineae. The valves between this ventricle and auricle are called tricuspid. The opening for the pulmonary artery is above, and furnished with three valves called semi-lunar, or sigmoid, which have in the centre of their edges, a small cartilaginous body, called corpusculum aurantii. Between the outer face of each valve, and the artery is a pouch called the sinus of Valsalva.

What are the characteristics of the left auricle? Its figure is more regularly quadrangular than the right. Its tip or ear-like portion is situated at the left of the pulmonary artery, and it is longer, narrower, more crooked, and more notched than the right. The opening between the left auricle and ventricle is also called ostium venosum.

What are the characteristics of the left ventricle? The shape of its cavity resembles a long ovoidal or conical body, with its parietes about eight lines in thickness. Its internal surface has the same arrangement as the right ventricle in having the fleshy columns called columnae carneae. The ostium venosum on this side is furnished by valves called the mitral, the margins of which are also furnished with chordae tendineae. The orifice of the aorta is furnished with three semilunar valves corresponding exactly with those at the origin of the pulmonary artery, except that they are thicker and stronger.

The sinuses of Valsalva also exist in the same manner.

What are the blood vessels of the heart? They are the right and left coronary arteries, and great and lesser coronary veins.

Where are the nerves of the heart derived from? Principally from the cervical ganglions of the sympathetic; they follow the coronary arteries in their distribution.

Arteries.

What is the great trunk of the arterial system called? Aorta.

What are the branches of the aorta? The right and left coronary arteries which go to the substance of the heart,

From the arch; the arteria innominata, the left primitive carotid, and the left subclavian arteries.

From the thoracic portion, the bronchial, one for each lung and sometimes two or more; the œsophegal, which are

five or six small twigs; the posterior arteries of the mediastinum; and the inferior intercostals on each side, which supply the ten lower intercostal spaces.

From the abdominal portion; the phrenics, two in number, the cœliac, the superior mesenteric, the capsular, one or more on each side, the emulgents, and spermatics, one on each side, the inferior mesenteric, the lumbar, five on each side, and the middle sacral arteries. It then terminates in the primitive iliacs.

How is the arteria innominata divided? Into right subclavian and right primitive carotid.

How are the carotids on each side divided? Into internal and external carotids, opposite to the os hyoides.

What are the arteries given off by the internal carotid? The opthalmic, the communicating artery of Willis, the choroid, the anterior and the middle cerebral.

What are the branches given off by the external carotid artery? The superior thyroid, the lingual, the facial (which gives off the submental, the inferior labial, the inferior coronary, and the superior coronary), the inferior pharyngeal, the occipital, and the posterior auricular, when it divides into two large trunks, the internal maxillary, and the temporal.

The temporal gives off the transverse facial, the middle temporal, and the anterior and posterior temporal.

The internal maxillary sends off the following branches: the arteria-tympanica, the arteria meningea parva, the meningea magna or media, the maxillaris or inferior dental, the temporalis profunda, two in number, pterygoideæ, buccalis, maxillaris superior, infra orbitalis, palatina superior, pharyngea superior, and the spheno-palatina, which is the terminating trunk.

What are the branches given off by the subclavian arteries on each side? The vertebral, the inferior thyroid, superior intercostal, internal mammary, and posterior cervical; after passing the subclavian muscle, it is called axillary artery to the lower margin of the arm pit; and from this place to the elbow joint; it is called brachial.

What are the branches of the axillary artery? The superior scapular, four external mammary, inferior scapular, and the anterior and posterior circumflex.

What are the branches of the brachial artery? The profound, the small profound, nutritious, and anastamotic; it

then bifurcates into the radial and ulnar in front of the brachialis internus muscle.

What are the branches of the radial artery? The recurrens radialis, superficialis volæ, dorsalis carpi, magna pollicis, radialis indicis, and the palmaris profunda, which forms the arcus profundus.

What are the branches of the ulnar artery? The recurrens ulnaris, the interossea anterior and posterior, and dorsalis manus. It then forms the arcus sublimus (from which branches are sent that supply the fingers, called digital), and terminates by a branch which joins the arteria magna pollicis.

What are the branches of the cœliac artery? It divides into three trunks; the gastric, hepatic, and splenic. This division is sometimes called tripus Halleri.

The gastric artery passes along the lesser curvatute of the stomach.

The hepatic artery gives off the right gastric or gastro-epiploic, which is distributed to the right half of the great curvature of the stomach, the main branch goes to the transverse fissure of the liver, and divides into the right and left branches.

The splenic artery gives off the pancreatic, the left gastric, which is distributed to the left half of the great curvature of the stomach, and the vasa brevia, which are given off just before this artery enters the spleen; they are five or six in number, and distributed upon the great extremity of the stomach, between the cardia, and left gastric artery.

What are the branches of the superior mesenteric artery? There are three colic arteries, called ileo-colica, colica-dextra, and colica-media, besides the principal distribution to the small intestines.

What are the branches of the inferior mesenteric artery? The superior, middle, and the inferior colic arteries; and the superior hæmorhoidal.

How are the primitive iliacs divided? Into two trunks, called internal and external.

What are the branches of the internal iliac artery? The ilio-lumbar, lateral sacral, obturator, middle hæmorhoidal, vesical, uterine, gluteal, and the ischiatic. The ischiatic gives off the internal pudic, which again gives off the lower hæmorhoidal, perineal urethro-bulbar, ramus superficialis dorsi penis, and the cavernous artery of the penis.

What are the branches of the external iliac? The epigastric, and circumflex of the ilium.

What is the extent of the femoral artery and what are its branches? It extends from the crural arch to its perforation of the abductus magnus; and gives off the superficial artery of the abdomen, external pudics, profunda femoris (which divides into external and internal circumflex); the first, second, third, and fourth perforating, and the anastomosing arteries.

What is the extent of the popliteal artery and its branches? It is a continuation of the femoral after its passage through the tendinous insertion of the adductor magnus; extends to the opening in the interosseous ligament, and gives off the superior internal, superior external, middle, inferior internal, and inferior external articular arteries, and the gastrocnemial; it then divides into the anterior, and posterior tibial arteries.

What are the branches of the anterior tibial artery? The recurrent tibial, internal and external malleolar, tarsal, metatarsal, dorsal artery of the great toe, and joins with the external plantar in the sole of the foot.

What are the branches of the posterior tibial? The peroneal, the internal and external plantar; this last unites with the anterior tibial artery, and forms the arcus plantaris, which gives off the digital, and the perforating arteries.

Venous System.

What is the office of the veins? To collect the blood from the arteries in all parts of the body, and return it to the heart.

What is their general arrangement? There are two accompanying each artery wherever the part is intended for locomotion; besides which there is an abundant class of superficial, or subcutaneous veins which form a vascular net work over the whole body. Those accompanying the arteries are termed venæ comites, and take the names of the arteries which they accompany. In some other cases two arteries empty into one vein.

What is their structure? Their coats are much thinner than the arteries, but similar to them in structure. The internal coat is thrown into duplicatures or valves, which are more abundant in the superficial than in the deep seated veins.

What is the great trunk of the venous system called? Vena cava ascendens, and descendens.

What veins form the vena cava descendens? The two venæ innominatæ.

What forms the vena innominata? It is formed on either side by the junction of the subclavian with the internal jugular.

What venous trunks discharge into the vena innominata, or descending cava? Inferior thyroidal, vertebral, superior intercostal, internal mammary, vena azygos, and some others of smaller size.

What veins form the vena azygos? The ten inferior intercostals of the right side, and four or six of the left; it anastimoses inferiorly with some of the veins of the abdomen.

What forms the internal jugular vein? It extends from the base of the cranium, where it communicates with the lateral sinus on each side, to the internal margin of the first rib. Its commencement is enlarged into what is called its gulf, or sinus.

What forms the external jugular, and where does it terminate? It is a continuation of the temporal, receives the facial and lingual; and sometimes superior thyroid, and occipital. It usually terminates in the subclavian.

Where is the subclavian situated? It extends from the axillary to the vena innominata, and goes under the subclavian muscle, in front of the subclavian artery; and where it passes over the first rib, the scalenius anticus muscle is between them, the vein being in front of it.

What forms the axillary vein, and where is it situated? The union of the basilic with the brachial vein. It is in front of the axillary artery, included in the same sheath, and involved with the axillary plexus of nerves. At the under surface of the clavicle it takes the name of subclavian.

How are the veins of the superior extremities arranged? Into deep seated and superficial. The former take the names of the arteries which they accompany, and are two to each artery. The latter are divided into two principal trunks; the cephalic and basilic.

What is the situation of the cephalic vein? It is the trunk coming from the thumb and fore-finger, recives several small branches on its course, and terminates in the axillary vein.

What is the situation of the basilic vein? It begins by

the trunk from tne ulnar side of the hand, receives branches in its course, and by its union with the brachial, forms the axillary vein.

What is the situation of the median vein? It is in the middle and front of the fore-arm; its trunk ascends, and below the bend of the arm divides into two; one branch going to the cephalic vein, and called median cephalic, and the other going to the basilic vein, is called median basilic.

Where is the vena cava ascendens situated, and what branches does it receive? In front of the spinal column to its right, and extends from the junction of the primitive iliac veins (which unite to form it opposite the fourth lumbar vertebra) to the right auricle of the heart where it empties. It receives the middle sacral, lumbar, spermatic, emulgent, capsular, hepatic, and phrenic veins.

What forms the primitive iliac vein on each side? The junction of the external and internal iliacs, opposite the sacro-iliac symphysis.

What forms the internal iliac or hypogastric vein? It arises by venous branches corresponding with the distribution of the hypogastric artery, some of which are termed plexus; and are the hemorhoidal, vesical, sacral, pudendal, uterine, and vaginal plexuses; and the gluteal, obturator, and ileo-lumbar veins.

What forms the external iliac vein? It is a continuation of the femoral, and receives the epigastric, and circumflex iliac veins, which correspond with arteries of the same name.

What is the arrangement of the veins of the inferior extremities? Into deep seated and superficial. The former follow the course of the arteries, take the same name, and are two for every artery as far up as the ham, and also for the muscular arteries of the thigh.

What are the superficial veins? The saphena minor, and major.

What is the situation of the saphena minor? It commences near the external side of the top of the foot and external ankle; the trunk ascends along the back of the leg superficially, and terminates in the popliteal vein.

What is the situation of the saphena major? It commences at the internal part of the foot; its trunk passes upwards in front of the internal ankle, internal face of the leg on a line with the posterior margin of the tibia, and is continued on a line with the posterior margin of the sartorius muscle;

it then terminates in the femoral vein about twelve or eighteen lines below Poupart's ligament.

From whence is the vena portarum derived? The viscera of the abdomen, and corresponds with the superior and inferior mesenteric arteries, and the cœliac, with the exception of the hepatic branch.

What is meant by the sinus portarum? The vena portarum when it reaches the transverse fissure of the liver divides into a right and left branch, at right angles with the main trunk, but in a line with one another; these constitute the sinus portarum.

Where do the terminating branches empty? Into the venæ hepaticæ.

Absorbent or Lymphatic System.

What are the absorbents? They are small, pellucid, transparent, cylindrical tubes, whose office is for interstitial absorption, and also to take up the nutritious part of our food.

How are the absorbent vessels divided? Into lacteals, and lymphatics. The former are those which absorb the chyle, and the latter are found in other parts of the system; their structure is similar, and differ only in the fluid with which they are occupied. They are also divided into superficial and deep seated

What are lymphatic glands? They are flattened, ovoidal bodies, of a reddish ash color, indurated, and of variable volume, through which, the lymphatic vessels have to pass on their way to the thoracic duct. The vessels that enter them are called vasa inferentia, and those that depart vasa efferentia.

Where are they found? In clusters, below the occiput, under the ears and jaw, along the side of the neck, in the axilla, root of the lungs, mesentery, loins, pelvis, &c.

What are the main trunks called? Thoracic ducts.

What is the course and arrangement of the thoracic ducts? The left thoracic duct is the main trunk of the absorbent system. It begins about the second or third lumbar vertebra. Shortly after its commencement it is dilated, and this dilatation is called the reservoir of Pecquet, or receptaculum chyli. The thoracic duct enters the thorax between the crura of the diaphragm, ascends to the fourth dorsal vertebra, when it inclines to the left side, ascends into the

neck near the head of the first rib; it then turns downwards and forwards, over the left subclavian artery, and discharges into the point of junction of the left subclavian, and internal jugular veins. It is commonly about the size of a crow quill.

The right thoracic duct, or as it is sometimes called, the right brachio-cephalic, is about one inch long, and descends to empty itself into the junction of the right internal jugular with the right subclavian veins. It is formed by the lymphatic trunks of the right side of the head and neck, from the right upper extremity, and the superficial lymphatics of the right side of the thorax, and parts adjacent to it.

Nervous System.

How is the nervous system divided? Into the central or internal part, composed of the brain and spinal marrow; and the external, or peripheral portion, which consists in the nerves of the brain and spinal marrow.

The central portion is composed of two kinds of substance; one called medullary, and the other cineritious.

The peripheral portion, or the nerves, are formed by parallel fasciculi, the finest filaments of which, are composed of a tube filled with nervous matter. The sheaths of the nerves is called neurilemma; it envelops the nerves, and also forms an envelope for each particular fibre, and fasciculi.

There are three modes by which these fasciculi unite with each other, by anastomosis, plexus, and ganglion.

Spinal Marrow.

What are the characteristics of the spinal marrow? It is within the vertebral cavity, and extends from the first vertebra of the neck to the first or second of the loins, inclusive. It has three membranes; dura mater, pia mater, and tunica arachnoidea; its general form is cylindrical, flattened slightly before and behind; its substance is of two kinds; cineritious, and medullary.

The spinal marrow gives off from its sides thirty pairs of nerves; eight of them are called cervical, twelve dorsal, five lumbar, and five sacral. The spinal nerves are formed from two roots; an anterior, and a posterior, which are separated by the ligamentum denticulatum.

The arteries of the spinal marrow are derived from the vertebrals, intercostals, lumbar, and sacral.

Brain.

What is understood by the encephalon, or brain? It is that part of the central portion of the nervous system contained within the bones of the cranium; of an oval shape, surrounded by three membranes, the dura mater, tunica arachnoidea, and pia mater. Its substance is divided into cineritious and medullary.

The brain is divided into medulla oblongata, protuberantia annulare, or pons Varollii; cerebrum, and cerebellum, each of which are symmetrical, and consist in right and left halves, perfectly alike.

What are the processes of the dura mater? Falx cerebri, tentorium cerebelli, and falx cerebelli.

What are the sinuses of the dura mater? Superior longitudinal, lateral, one on each side, inferior longitudinal, sinus quartus or rectus, petrous two on each side, the superior and inferior, cavernous one on each side, circular, and the occipital.

What is the torcular Hierophili? It is the union between the longitudinal, the fourth, and the lateral sinuses.

What are the characteristics of the medulla oblongata? It extends from the superior margin of the first cervical vertebra to the middle of the basilar process of the os occipitis. On its under surface, on each side, is the corpus pyramidale.

The eminentia olivaria are two bodies, one on either side, at the external margin of the pyramidal bodies.

The corpora restiforme, one on either side, are placed at the lateral margins of the medulla oblongata, posterior to the olivaria, and is a continuation of the posterior portion of the medulla spinalis. Between the corpora restiforme on the superior face of the medulla oblongata is an excavation, named from its shape calamus scriptorius, which forms a part of the floor of the fourth ventricle of the brain.

What are the characteristics of the pons varolii? It is a large projecting body, placed at the top of the medulla oblongata upon the junction of the body of the sphenoid bone with the basilar process of the os occipitis, convex, and about one inch in diameter.

What are the characteristics of the cerebellum? It is in the posterior fossa of the cranium, separated from the posterior lobes of the cerebrum by the tentorium, and connected with the pons varolii, by the crus of the cerebellum. It

measures four and a half inches in the transverse diameter, two and a half in thickness, and about the same from before backwards. It has on its superior face the sulcus superior cerebelli; another on the inferior surface, called the sulcus inferior cerebelli.

The superior middle ridge is called vermis superior, the anterior extremity of which is from its elevation called monticulus cerebelli. The vermis inferior is a ridge occupying the deep sulcus which divides the cerebellum on its inferior surface into hemispheres. The central part of the cerebellum is formed by the vermis superior, and inferior, and is the fundamental portion.

The valve of Vieussens arises from the cerebellum under the anterior part of the base of the monticulus.

The corpus rhomboideum, or dentatum, is in the middle of the trunk of the arbor vitae.

What are the characteristics of the cerebrum? It weighs about three pounds, it is ovoidal, measures about six inches in its antero posterior diameter, five inches in breadth, and four or five deep. It is separated by the longitudinal fissure into hemispheres, the right and left. At the bottom of this fissure is the corpus collosum, which connects the two hemispheres together. The hemispheres are each divided on their under surface into three lobes, anterior, middle, and posterior. The anterior is anterior to the fissure of Sylvius; the posterior rests on the tentorium, and the middle is between these two. The periphery is formed into convolutions, called gyri, and these are separated by fissures called sulci.

The crura cerebri are about eight lines long, mutually diverge, and are separated by a fissure, which is the third ventricle of the brain.

The eminentia mammilares, or corpora albicantia, are two small bodies, one on each side, situated near the anterior extremities of the crura cerebri.

The infundibulum is placed immediately before the eminentia mammilares. It is flattened, conoidal, half an inch long, base upward, and its apex going downwards and forwards. Its base is hollow, and opens into the third ventricle, but the point is closed.

The pituitary gland is situated in the sella turcica.

The tuber cinerum, or pons tarini, is a portion of the under surface of the crura cerebri.

The thalami optici, two in number, called also ganglia postica, are situated on the superior face of the crus cerebri, about an inch and a half in length, and eight lines broad and deep. The thalami are medullary externally, cortical, and medullary internally, and united to each other by the commissura mollis.

The corpora striata, or ganglia cerebri antica, are two pyriform bodies, situated before the thalami, at the bottom of the lateral ventricles. They are two and a half inches long, convex in their upper surface, eight lines broad at the front, and taper backward to a point. The septum lucidum is between them in front, but posteriorly they diverge so as to admit the thalami between them. The taenia striata is placed in the angle formed between the internal margin of the corpus striatum, and the external one of the thalamus opticus. It is a small medullary band commencing near the anterior crura of the fornix, and observing the course of the curved fissure in which it is placed; it goes to the posterior end of the corpus striatum.

The corpus callosum is placed at the bottom of the fissure which separates the two hemispheres, and may be brought into view by slicing them off to a level with it. It is then seen to be a medullary layer uniting the mass of the two hemispheres, for two-fifths of the long diameter of the brain, about eight lines in breadth, marked by a middle line called raphe, and forms the roof of the lateral ventricles.

The fornix or trigone cerebral is placed immediately below the corpus callosum. It is triangular, the base of which is behind, and the apex in front, about an inch and a half long in its body, and one inch wide at the base, which is beneath the corpus callosum, continuous with it, and gives the fornix the appearance of being a part of the same structure doubled on itself.

The septum lucidum is a partition placed vertically in the middle of the brain, and extends from the corpus callosum above, to the fornix below; between its lamina is situated the fifth ventricle, or ventriculus septi.

The pineal gland is beneath the posterior margin of the fornix upon the superior part of the tubercular quadrigemini.

The velum interpositum is a reflection of pia mater, separating the pineal gland from the fornix, and the fornix from the thalami nervorum opticorum.

The tubercula quadrigemini are situated on the superior face of the crura cerebri, and just behind the thalami.

How many ventricles of the brain are there? Four; two lateral, placed one in either hemisphere of the cerebrum, the third, between the two thalami, and the fourth under the cerebellum.

The lateral ventricles each consist of a body and three processes, called cornua. The cornua are named from their position anterior, posterior, and lateral, or inferior.

In the posterior cornu are seen the hippocampus minor. In the inferior, or lateral cornu is found the cornu ammonis, or hippocampus major, terminated by the pes hippocampi.

The third ventricle is bounded below by the pons tarini, crura cerebri, and the eminentiae mammillares; and above by the velum interpositum, and fornix.

The fourth ventricle is bounded in front by the tuber annulare, and medulla oblongata; behind by the fundamental portion of the cerebellum; above by the valve of the brain and tuberculi quadrigemini; laterally by the medullary prolongations, from the cerebellum to the tubercula quadrigemini, and is open below when the pia mater is removed.

NERVES.

The following nerves are in pairs and the description of one side applies equally to the other:

Where does the olfactory nerve arise from? By three fasciculi or roots from the basis of the brain, at the corpus striatum, in the fissure of Sylvius. They unite, and at the anterior extremity this nerve is enlarged into what is termed the bulb, which sends from its under surface filaments to the Schneiderian membrane through the cribriform plate of the ethmoid bone.

Where does the optic nerve arise from? It arises by a broad flattened root, a portion from the thalamus opticus, and another part from the testis, it also adheres to the crus cerebri, and passes under it. The optic nerves of the two sides are fused together, and form what is called their chiasm, or crossing; after this they separate, and each one passes through the optic foramen of its respective side.

Where does the third pair of nerves arise from? From the internal face of the crus cerebri, two lines in advance of the anterior margin of the tuber annulare. It penetrates the orbit, through the sphenoidal fissure, and it is distributed to most of the muscles of the eye ball.

Where does the fourth pair of nerves arise from? It arises by two filaments from the upper anterior face of the valve of the brain. It goes to the orbit through the sphenoidal fissure, and is distributed to the superior oblique muscle.

Where does the fifth pair of nerves arise from? By several distinct filaments from the pons Varolii, or tuber annulare. They unite, and form the semilunar ganglion, or ganglion of Gasser, which sends off three branches, viz: the first, or ophthalmic, through the sphenoidal fissure; the second, or superior maxillary through the foramen rotundum; and the third, or inferior maxillary, through the foramen ovale. Their general distribution is to the orbit, the face, and the tongue.

Where does the sixth pair of nerves arise from? From the base, or upper extremity of the corpus pyramidale. It passes into the orbit by the sphenoidal fissure, and is distributed upon the abductor oculi muscle.

Where does the seventh pair of nerves arise from? That portion of the seventh pair, called the facial, or portia dura, arises by two branches from the medulla oblongata. It emerges through the stylo-mastoid foramen, and is distributed to the muscles, and skin of the head.

That portion called the auditory, or portia mollis, arises from the medullary striae on the surface of the calamus scriptorius, and from the corpus restiforme. It penetrates the meatus auditorius internus, and is distributed to the labyrinth of the ear.

Where does the eighth pair arise from? That portion of the eighth pair, called glosso-pharyngeal, arises from the posterior cord of the medulla oblongata. It emerges through the foramen lacerum posterius, and is distributed to the tongue, and pharynx.

That portion called pneumogastric, arises from the corpus restiforme of the medulla oblongata. It passes out through the foramen lacerum posterius, and is distributed to the organs of respiration, and to the stomach.

That portion called the accessory nerve, arises from the posterior fasciculus of the medulla oblongata, and spinal marrow. It is formed by the union of six or seven roots from the spinal marrow, and three or four from the medulla oblongata, and passes into the cavity of the cranium through the foramen magnum, passes out again through the foramen lacerum posterius, and is distributed to the muscles, and integuments of the neck.

Where does the ninth pair of nerves arise from? By several fasciculi, from the fissure which separates the corpus pyrimidale from the corpus olivare, on the medulla oblongata. It gets out of the cranium through the anterior condyloid foramen, and is distributed to the muscles of the tongue.

From whence are the arteries of the brain derived? From the internal carotids, and vertebrals.

The internal carotid passes into the cranium through the carotid canal; when it reaches the anterior clinoid process, it sends off the ophthalmic artery to the orbit. It is then distributed to the brain by the arteria choroidea, arteria callosa, or anterior cerebri, arteria communicans anterior, and the arteria cerebri media.

The vertebral artery is a branch of the subclavian, and passes through the transverse processes of the six superior vertebræ of the neck, enters the cranium through the occipital foramen, and continues till it reaches the posterior margin of the tuber annulare, when the two coalesce, and form a single trunk called the basilar. Before this union, it sends off the spinalis posterior and anterior, and the inferior cerebelli. The basilar gives off the arteria superior cerebelli; it then divides into the posterior artery of the cerebrum, one on each side. These last arteries are joined by the arteria communicans posterior, which completes the circle of Willis.

How is the circle of Willis formed? Anteriorly, and laterally by the internal carotids, and their branches: the posterior part by the basilar, and its bifurcation; and forms a free communication between the vessels of the two sides of the brain.

Senses.

From what source is the pituitary membrane supplied with nerves? From the olfactory, or first pair, and from the fifth pair.

From what source is the blood vessels of the nose derived? From the internal maxillary, and the ophthalmic arteries.

Eye.

What constitutes the organ of vision? The ball of the eye, and its auxiliary parts.

What are the auxiliary parts of the eye? The eye lids, or palpebrae, supercilia, ligamentum palpebrale externum,

conjunctiva, glands of Meibomius, cilia, muscles, lachrymal aparatus, consisting of the lachrymal glands, lachrymal duct, lachrymal sac, lachrymal caruncle, semilunar valve, or fold, and puncta lachrymalia.

The muscles are the levator palpebrae superiorus, the four recti, and two oblique.

What nerves supply the orbit of the eye? They are derived from the motor oculi, or third pair, the trochlearis, or fourth pair, the first branch of the trigeminus, or fifth pair, and the motor oculi externus, or sixth pair.

What arteries supply the orbit of the eye? The ophthalmic, which has numerous branches.

What forms the ball of the eye? It is formed by concentric tunics, and humours contained in them. The tunics are the sclerotica, and cornea externally; the choroidea, and the iris next in order; and the retina internally.

The humours are the vitreous, which constitutes the principal part of the eye ball; the crystalline which is in front of the vitreous, and the aqueous, between the crystalline, and the cornea.

The choroid coat is united at its anterior margin to the sclerotica by the ciliary ligament.

The pigmentum nigrum is spread over the whole internal surface of the choroid, between it and the retina.

The vitreous humour is composed of the tunica hyaloidea, and a thin fluid.

Ear.

How is the ear divided? Into the external ear, the tympanum, and the labyrinth.

Of what is the external ear composed? It is formed of the exterior portion commonly called the ear, and by a canal which leads internally to the tympanum. The outer portion is divided into pinna, and lobus, the former is the cartilaginous portion, and the latter is soft, and pendulous attached to its inferior portion.

The different parts of the external ear are, the concha, meatus auditorius externus, the helix, antihelix, fossa innominata, tragus, and antitragus.

The muscles of the external ear are very feebly developed, and are helicis major, and minor, tragicus, antitragicus, transversus auriculae, attolens auriculae, retrahens auriculae, and the anterior auriculae.

What is the situation of the tympanum? It is interposed

between the meatus auditorius, and the labyrinth. It is three lines in depth, six in the antero posterior diameter, and the vertical measurement about the same.

The membrana tympani is situated between the meatus externus, and tympanum, and is composed of four lamina.

The floor of the tympanum is marked by a rising, called the promontory, and openings called the foramen ovale, and foramen rotundum; the latter in the dried bone is the opening to the cochlea.

The eminentia pyramidalis is a small eminence, projecting from the posterior part of the tympanum; it is hollow, and communicates at the other end with the canal of Fallopius.

The eustachian tube is at the fore part of the tympanum, and communicates at the other extremity with the pharynx.

The bones in the tympanum are the malleus, incus, orbiculare, and stapes, which are successively articulated, so as to form a chain. The muscles which move these bones are the laxator tympani, tensor tympani, stapedius, and the laxator tympani minor.

What is the situation of the labyrinth? It is placed on the inner side of the tympanum, and is divided into three portions, the vestibulum, semicircular canals, and the cochlea.

The nerves which are spent in part or wholly upon the organ of hearing, are the auditory, portio dura, and trigeminus, or fifth pair.

The Great Sympathetic Nerve.

What is meant by the sympathetic nerve? It consists in a series of ganglions, extending from the base of the cranium to the lower extremity of the sacrum. These ganglions are united together by an intermediate nervous cord; and send off filaments to adjacent organs; there is one of them for each intervertebral space, except those of the neck. Besides those there are several others, situated around the trunks of some of the large vessels.

What nerves form the commencement of the sympathetic? It is formed by a branch of the nervus motor externus oculi, and one from the vidian nerve. These send each a twig downwards, through the carotid canal when they unite into a single chord that runs into the superior part of the superior cervical ganglion.

How many cervical ganglions are there? Three, a superior, middle, and inferior.

The first is opposite to the transverse process of the second cervical vertebra, and behind the internal carotid artery. The middle is opposite to the space between the fifth and sixth cervical vertebra. The inferior is formed in the interval between the head of the first rib, and the transverse process of the last cervical vertebra.

Where is the cardiac plexus situated? Between the arch of the aorta and the lower part of the trachea, and bronchiae. It is formed principally from the branches sent by the three cervical ganglions of the sympathetic of each side; there are filaments also from the recurrent and the par vagum. This plexus is distinguished by the softness of its texture, and its branches may be divided into anterior, posterior, and inferior.

How many thoracic ganglions of the sympathetic are there? Twelve; they are placed on or near the heads of the ribs, are connected together by the main chord of the sympathetic, and receive filaments from the dorsal nerves.

What are the branches of the thoracic ganglions? The great splanchnic nerve arises by small branches from the sixth, to the ninth, or tenth thoracic ganglions, inclusive.

The small splanchnic nerve is derived from the tenth and eleventh thoracic ganglions.

Where is the semilunar ganglion situated? On each side of the aorta, and is formed by an assemblage of several smaller ones, which receive their fasciculi from the great splanchnic nerves. These several ganglia are united together, and form the root of the solar plexus, from which proceed branches to the viscera: viz. the cœliac, or stomachic plexus, to the liver duodenum and pancreas, the splenic to the spleen, &c., each following the arteries as they proceed to their respective destinations.

How many lumbar ganglions of the sympathetic are there? Five on either side, placed anteriorly on the sides of the bodies of the lumbar vertebrae.

How many are there of the sacral ganglions? Generally three, sometimes four, or five, on the anterior face of the sacrum, near the corresponding foramina for the transmission of the sacral nerves. The last of the sacral ganglions detaches downwards one or more filaments, which anastimose with the corresponding ones of the opposite side, and

forms a sort of arch, which is the termination of the sympathetic nerve.

Spinal Nerves.

How are the nerves of the medulla spinalis arranged? Into cervical, thoracic, and abdominal.

What is the origin of the phrenic nerve? It arises from the anterior fasciculus of the second and third cervical, and generally by two or three filaments from the upper part of the brachial plexus.

What nerves contribute to form the brachial plexus? The anterior branches of the four inferior cervical nerves, and the first dorsal or thoracic. It extends from the scaleni muscles to the axilla on a level with the neck of the os humeri, and surrounds the axillary artery, like the braids of a whip chord, from the clavicle to the os humeri, below its head.

What nerves proceed from the axillary or brachial plexus? The scapular, thoracic, axillary, two cutaneous, radial, ulnar, and median.

What is the number of thoracic, or dorsal spinal nerves? They consist of twelve pairs.

What is the number of the abdominal spinal nerves? There are five lumbar, and five, sometimes six sacral, on each side.

The anterior fasciculi form a plexus from the upper part of the loins to the lower part of the sacrum, called the plexus cruralis, which has been divided by anatomists into plexus lumbalis, formed by the four superior lumbar nerves, and the plexus ischiadicus, formed by the last lumbar, and the sacral.

What are the nerves given off by the lumbar plexus? The cruralis anterior, nervus obturatorius, a branch running to join the sciatic plexus, the abdomino crural branches, spermaticus externus, cutaneous externus, cutaneous medius, cutaneous anterior, and cutaneous internus.

What are the branches which are given off by the sciatic plexus or plexus ischiadicus? The nervi glutei, nervus pudendalis longus inferior, ramus femoralis cutaneous posterior, nervus pudendalis longus superior, and the nervus ischiadicus, or great sciatic.

What is the division of the great sciatic nerve? The popliteal or posterior tibial, and the peroneal; and in its

course gives off the cutaneus internus superior, the cutaneous internus inferior, and a large trunk or three distinct branches, which go to the adductor magnus, semi-membranosus, biceps, and semi-tendinosus.

The peroneal nerve divides into two branches, the peroneus externus, and the tibialis anterior.

The posterior tibial, or popliteal nerve, gives off the external saphenus, and several small branches to the muscles of the leg, when it divides in the hollow of the os calcis into the internal and external plantar nerves.

PART II.—CHEMISTRY.

What is Chemistry? It is the science which makes known the composition of bodies, and the manner which they comport with each other.—*Berzelius.*

Caloric.

What is understood by the term caloric? It is the cause or agent producing the sensation and phenomena of heat.

What are some of the properties of caloric, or heat? It has been supposed to be a subtle fluid, the particles of which repel each other, and are attracted by all other substances; it is imponderable; present in all bodies; transferable from one body to another, tending to an equilibrium in two ways, by direct contact, or conduction, and by radiation.

How are bodies divided in regard to their power of conducting caloric? Into conductors, and non-conductors; among the former are the metals, and among the latter, or those which conduct very imperfectly, are glass, wood, charcoal, and porous substances generally. The best conductors of the metals are, first, silver; then gold, copper, and tin; then platinum, iron, and lead.

Are liquids good conductors? Liquids are good conductors only from the mobility of their particles, by which they change their places, and thus carry heat though them rapidly, if it is applied at the bottom. But if it is applied at the top the conducting power is very feeble.

What is understood by the radiation of caloric? When heat passes from one body to another, independent of a medium, therefore in vacuo, it is termed radiation; and the heat so distributed is called radiant or radiated heat.

Suppose a heated body suspended in the air is reduced to

an equilibrium, what are the modes by which it is accomplished? It is done in three ways; first, by the conducting power of the air, which is very trifling; secondly, by the mobility of the air in contact with it; and thirdly, by radiation.

How is heat distributed in radiation? It is emitted from the surface of a hot body equally in all directions, in right lines, like radii from the center to the circumference of a sphere; and when they fall upon another body are distributed in three ways; reflected, absorbed, or transmitted. In the first and third cases the temperature of the body on which the rays fall are not affected, in the other it is increased.

In what proportion does heat decrease as we recede from a body? It diminishes in the ratio of the squares of the distances from the radiating body.

Is the radiating power of a body influenced by the nature of the radiating surface? It is; a polished plate of metal, radiates very imperfectly, if roughened its radiating power is increased; and if covered with a thin layer of paper, isinglass, wax, or resin, it is greatly increased.

The color of surfaces also has a great effect on the radiating power; black radiating the most rapidly, red less, and white still less.

Can heat be reflected when unaccompanied with light? It can, and is subject to the same laws in this respect that light is.

Will a good radiating surface make a good reflector? No; neither will a good reflector make a good radiator, these properties being inversely to each other.

When heat strikes an opaque body, and it is not reflected, what becomes of it? It is invariably absorbed; and these rays are supplimental to the rays which may be reflected if any are reflected.

What relation exists between the absorptive, and the reflective powers of bodies? They are in an inverse proportion to each other. So that the more rays of heat that are absorbed by a body the fewer are reflected, and vice versa.

What relation exists between the radiant, and absorptive power of bodies? Those surfaces of bodies which have the absorptive power, have the radiating power directly proportional.

So that one class of surfaces are good absorbers, and ra-

diators, while another are good reflectors, and retainers; these qualities being in various proportions in different surfaces.

What is meant by transmission of heat? It is its passage unchanged, or nearly so, through transparent media, or through a vacuum.

By what means do bodies attain and keep up an equality of temperature? According to the theory of Prevost all bodies are constantly radiating heat, or calorific rays, and that the temperature of a body falls when it radiates more than it absorbs; on the contrary, the cooler body becomes warmer when it absorbs more than it radiates; and the temperature is stationary when the quantities emitted and received are equal.

An instance of the first case is exhibited when a hot body is surrounded by colder ones; of the second, when a colder one is surrounded by warmer, and of the latter, when the temperature of the bodies near each other is equal.

According to another theory, bodies of equal temperature do not radiate at all, and when the temperature is unequal the hotter bodies alone radiate.

What are some of the effects of heat on matter? It is essential to vital actions, both animal, and vegetable. It influences the form of bodies, as regards their condition of solidity, fluidity, or vapour. It also powerfully influences chemical action and combination.

Does heat invariably expand all bodies? It does with the exception of some fluids, which are expanded also at high temperatures, and are contracted as the temperature falls, until at a certain temperature they again expand, forming an exception to the general law.

Upon what principle is a thermometer founded? The expansibility of fluids, and mercury is the one generally used.

Upon what principle is the pyrometer of Wedgewood formed? If we heat a mixture of aluminous earth and water or clay, it contracts from the expulsion of the water, and this contraction is an indication of the amount of heat to which it has been subjected.

What is understood by specific heat? It is the quantity of heat which one body contains compared with other bodies. This difference in bodies is sometimes termed capacity for heat.

What is understood by sensible, and insensible heat? Sensible heat is that heat of which we can take cognizance by our senses; and insensible heat is that which is proven to exist in a body, but does not affect our sensations, or our means of measuring temperature.

Has every substance a specific heat peculiar to itself? It has; and a change of composition will produce a change of capacity for heat.

When has a substance the greatest capacity for heat, in a solid, or liquid state? In a liquid condition.

Does the specific heat of a gas vary with the density and elasticity? It does. A diminution of density increases the capacity, and vice versa.

Is the specific heat of solids and liquids the same at all temperatures, when there is no change of composition? As the temperature increases, the capacity increases, but it is owing to their dilatation, as in the case of gases.

Does a change in specific heat produce a change in temperature? Always; an increase of capacity, therefore of the specific heat, dimishes the temperature; and a decrease of capacity, is attended with an increase of temperature.

What determines the condition of bodies as to their condition of solidity, liquidity, or gaseous state? The relative intensity of cohesion and repulsion.

To what is the property of repulsion owing? To heat; and the form of bodies may be made to vary as this is increased or diminished. Every solid may be converted into a fluid, and every fluid into a vapor, provided our means for the production of heat are sufficiently powerful.

Is heat absorbed and rendered insensible when bodies assume the liquid form? It is; and of course there is an increase of specific heat. This increase of specific heat is sometimes called the heat of fluidity, and seems necessary to the change.

Is heat evolved, or made sensible during the passage of a liquid into a solid? It is; and a familiar instance exists in the formation of ice, which never gets below 32° while changing from a liquid to a solid state, let the surrounding temperature be what it may.

How are aeriform substances divided? Into vapors and gases, and the differences between these, is the relative forces with which they resist condensation.

What is meant by a fixed body? It is a body which re-

sists the strongest heat we are capable of producing without vaporizing.

What is meant by a volatile body? It is a body which is converted into vapor by our means of producing heat.

What is ebullition? It is where vapor is formed rapidly, giving rise to a commotion in the liquid; and the temperature at which this takes place is called the boiling point.

What is meant by evaporation? It is where vapor is formed quietly and insensibly, and occurs at common temperatures.

Is the boiling point of all liquids the same at the common pressure of the atmosphere? No; sulphuric ether boils at 96° F., alcohol at 176°, and pure water at 212°, oil of turpentine 316°, and mercury 662°.

What circumstances modify the boiling point of liquids? Variations in the pressure of the atmosphere is the principal one. The material of which the vessel containing the liquid is composed, has an influence; also the presence of foreign particles. Liquids boil in vacuo at 140° lower than in the open air, and if subjected to sufficient pressure, may be heated to any extent without boiling.

What circumstances influence the process of evaporation? Extent of surface, and the state of the air.

What are the sources of heat? The sun, combustion, electricity, the bodies of animals during life, chemical, and mechanical action.

Light.

What is meant by the science of optics? It is that science which treats of light and vision.

What is the nature of light? According to Newton, it is an emanation of inconceivably minute particles from luminous bodies; very subtle, and travels in straight lines with immense velocity. According to the other theory it is simply vibrations, or undulations, of a subtle ethereal medium, and gives rise to vision in a manner similar to what the undulations of the air impresses the nerves of hearing.

What is meant by a ray of light? It is the smallest portion which can be separated from contiguous portions.

In what proportion does light decrease as we proceed from a luminous object? As the square of the distance from the luminous object increases.

When light falls on a body in what manner is it disposed of? It is either reflected, refracted, or absorbed.

Is solar light simple, or compound? It is a compound of seven simple, or primary colors, viz: red, orange, yellow, green, blue, indigo, and violet. There are also rays of the spectrum termed calorific, and chemical, and to which some have added the magnetizing.

What is understood by terrestrial light? It is artificial light; and the common method of obtaining it is by combustion.

Electricity.

What is understood by electricity? It is a principle called into action by rubbing substances called electrics, such as amber, glass, &c., with dry silk or cloth, and which causes contiguous light bodies to move towards them or be attracted, and the substance possessing this property of attraction is said to be electrified.

What is this attraction called? Electric attraction.

What takes place when these light substances come in contact with an electrified body? They recede or are repelled, and this property is called electric repulsion.

Can this property or electricity be conducted from one body to another? It can by some substances, but not by others, hence bodies are divided into conductors, and non-conductors.

What are the conductors? Metals, charcoal, plumbago, water, and substances which contain water in its liquid state.

Are electrics conductors? No; they may be handled without loosing their electricity except at the parts touched; on the other hand conductors are non-electrics, because the electricity is at once carried off.

Can a conductor be electrified or excited? It can by being insulated or cut off from contact with the earth, either directly or indirectly by means of a non-conductor.

Why do electric experiments usually fail in damp weather? Because the atmosphere then acts as a conductor, and conducts the electricity off.

What are the different conditions of electricity? There is one called vitreous because developed on glass, and another called resinous because developed on resinous substances. They are also termed positive, and negative, the terms

vitreous and positive being used synonymously, as are resinous and negative.

What relation do substances bear to each other, similarly electrified? They repel each other.

When dissimilarly electrified? They attract each other.

How is electricity excited? By chemical and mechanical means; when excited by chemical means, it is called galvanism.

What is a simple galvanic circle? It is a plate of zinc, and a plate of copper placed in a vessel of water, and the two metals are made to touch each other directly or by the intervention of a wire, and galvanism is excited.

What are compound galvanic circles? Series of simple circles.

For more full explanations see works devoted particularly to these subjects.

Specific Gravity.

What is specific gravity? It is the relative weight of equal bulks of different bodies.

How is it ascertained? By dividing the weight of the body, by the weight of the same bulk of water, which is assumed as unity.

How is the weight of a like bulk of water found? By weighing the substance out of water, and in water, the difference will be the weight of the water displaced.

Suppose the body is lighter than water? Then add the weight necessary to sink it to the weight of the body, and you have the weight of an equal bulk of water, which will enable you to find the specific gravity in the usual manner.

What are the instruments used to ascertain the specific gravity of liquids? Hydrometers.

What is assumed as unity in ascertaining the specific gravity of gases? The atmospheric air; and their specific gravity is ascertained on the same principle as liquids and solids.

Nomenclature.

What are the compounds of oxygen called, that do not possess acidity? Oxides.

What are they called when they possess acidity? Acids; and are named from the substance acidified by the addition of ic. For instance, sulphuric and carbonic acids are acid compounds of sulphur, and carbon with oxygen.

Suppose a base should form two acids with oxygen, what is the one called containing the least quantity of oxygen? It takes the name of the base with the addition of ous, as sulphurous acid.

By what name do we denote the simple non-metalic combustibles when united with one another, with a metal, or a metalic oxide? They are known by the addition of uret, as sulphuret, carburet, and phosphuret of iron, which denotes compounds of sulphur, carbon, and phosphorus with iron.

How are the oxides distinguished from each other? Protoxide is the first degree of oxidation; binoxide the second; teroxide the third; and the term peroxide is often applied to the highest degree of oxidation. Sesqui, one and a half, is used to an oxide the oxygen in which is to that in the first oxide, as one and a half to one, or as three to two.

What is usually understood by the term salt? A compound resulting from the union of an acid with a base. The definition of a salt, as given by Dr. Hare, is that it is a soluable compound, containing one or more acids, or corrosive ingredients, the qualities of the ingredients being either neutralized, or modified; the name is indicative of the composition.

If the acidified substance contains a maximum of oxygen, the name of the salt terminates in ate; if a mininum in ite. Thus the sulphate, carbonate, arseniate of potassa are salts of sulphuric, carbonic, and arsenic acids, with potassa. The terms sulphite, and arsenite of potassa, denote combinations of sulphurous, and arsenous acids with potassa.

What is understood by neutral, super, and sub salts? Salts are formed neutral, if the acid and alkali neutralize each other; super, if the acid is in excess; and sub if the alkali is in excess.

Another manner of expressing the relation between acids, and bases relates to the atomic constitution of the salt. If there is an equivalent of the acid, and alkali, the generic name of the salt is employed without any other addition.

If two or more equivalents of the acid are attached to one of the base, a numeral is prefixed indicating its composition, as the sulphate, and bisulphate of potassa; the oxalate, binoxalate, and quadroxolate of potassa. When the base is in excess, or the acid deficient, it is proposed to use the Greek numerals, dis, tris, tetrakis, to indicate the

equivalent of an alkali in a subsalt. In other compounds where two or more equivalents of a negative element enters, they are distinguished by the Latin numeral, and the Greek numerals are applied to that element regarded as positive. For instance, a bichloride contains two equivalents of the negative element chlorine; on the other hand, a dichloride signifies that one equivalent of chlorine is combined with two of a positive body.

Affinity.

What is understood by chemical affinity, or attraction? It is that affinity, or attraction which is exerted between the minutest particles of different kinds of matter, causing them to combine, and form new bodies, with new properties.

Does it act at sensible or insensible distances? It acts only at insensible distances, or when in apparent contact.

What is an instance of chemical attraction? When we mix water and alcohol, or water and sulphuric acid, a union takes place, which is an example in question.

What is understood by single elective affinity? Suppose we have a compound formed by the union of ammonia and oil, and to this we add sulphuric acid, the greater attraction of the ammonia for the sulphuric acid than exists between it and the oil, will cause it to leave the oil, and unite with the acid; this is an instance of single elective affinity; so termed, because there appears to be an election, or choice exercised.

What is meant by double elective affinity? Suppose two salts having different acids and bases; say carbonate of ammonia, and hydrochlorate of lime be mixed together, the carbonic acid will quit the ammonia, and unite with the lime; the hydrochloric acid will also leave the lime, and unite with the ammonia; so that both original salts will be decomposed, and two new ones formed; this is an instance of double elective affinity. The affinity which tends to resist a change is called quiescent affinity, and the one which tends to produce it is called divellent affinity.

What leading circumstances characterize chemical action? The loss of properties of the combining substances, and the acquisition of new ones in the new compound; changes of density, temperature, form, and color.

What circumstances modify the operation of affinity? Cohesion, elasticity, quantity of matter, gravity, pressure of the atmosphere, and the agency of the imponderables.

Do bodies unite in definite or indefinite proportions? Most bodies in forming chemical combinations unite in definite proportions. Some unite indefinitely, but with a feeble affinity.

What is understood by chemical equivalent? It is a number representing the least combining proportions of a body, which is equivalent to another body, and may be substituted for it in combinations. These combining proportions may be expressed by numbers, in which hydrogen is represented as 1, and they represent relative, and not absolute weights.

What is meant by isomeric bodies? Bodies are termed isomeric which contain the same chemical elements, and in the same ratio, and yet have chemical properties different from each other.

How may the equivalent of compounds be determined? By adding together the numbers representing the equivalents entering into the combination. These numbers are sometimes termed atomic weights.

OXYGEN.

How is oxygen obtained? It may be obtained from the peroxides of manganese, lead, and mercury, nitre, and chlorate of potash, by exposure to a red heat. It may be obtained from the former by heating it to redness in a gun barrel, or heating it in a flask with an equal weight of concentrated sulphuric acid, by means of a lamp.

What is the rationale of these two last processes? On applying a red heat to the peroxide of manganese it parts with half an equivalent of oxygen, and is converted into the sesquioxide.

When mixed with sulphuric acid the peroxide looses a whole equivalent of oxygen, and is converted into the protoxide which unites with the acid, leaving a sulphate of the protoxide in the retort.

What is the rationale when procured from the chlorate of potash? A retort of glass containing no lead in its composition should be used. The chlorate first becomes liquid, and on an increase of heat is wholly resolved into pure oxygen gas, which escapes, and into a white compound which is the chloride of potassium, and remains in the retort. The oxygen is therefore derived partly from the potassa, and partly from the chloric acid. Procured in this way it is very pure.

What are the properties of oxygen gas? It is colorless, insipid, inodorous, refracts light feebly, a non-conductor of electricity, the most perfect electro-negative substance we possess, heavier than atmospheric air, unites with some substances which are said to be oxidized, and are divided into oxides and acids, supports combustion in a high degree, and necessary in a diluted state to the respiration of animals; pure it is deleterious. Its specific gravity is 1.102; equivalent 8; and symbol O.

What is understood by combustion? In its common acceptation it means the rapid union of oxygen with a combustible material, attended with the emission of light and heat. But the union of many other substances are also characterized by similar phenomena.

Hydrogen.

How is hydrogen procured? It may be procured tolerably pure by passing the vapor of water over metalic iron, heated to redness, and by putting pieces of iron or zinc into dilute sulphuric acid.

What is the rationale of these processes? In the former case the oxygen of the water unites with the red hot iron and the hydrogen is set at liberty. In the latter, the oxygen of the water unites with the metal, and forms an oxide, which unites with the acid, and forms a sulphate while the hydrogen of the water is set at liberty.

What are the properties of hydrogen gas? It is colorless, neither odor or taste, a powerful refractor of light, the lightest body known, will not support respiration, a non-supporter of combustion, highly inflammable, but like other combustibles requires the aid of a supporter of combustion, and produces a remarkable alteration in the voice when breathed. If a jet be thrown upon spongy platinum, it is ignited. Its equivalent is 1; symbol H.

What is the product in the combustion of hydrogen? Water; which will be exactly equal in weight to the gases disappearing.

What is the proportion existing between the oxygen and hydrogen in the formation of water? By measure there is two volumes of hydrogen to one of oxygen: by weight 88.9 oxygen to 11.1 hydrogen, or nearly as 8 parts oxygen to 1 of hydrogen. Its symbol is H. O.

How many combinations are there of oxygen, and hydro-

gen? Two; one in the proportion to form water, and another which is the peroxide of hydrogen, and contains twice as much oxygen as is contained in water.

Nitrogen or Azote.

How is nitrogen procured? By burning a piece of phosphorus in a jar full of air, inverted over water; the oxygen of the atmosphere unites with the phosphorus forming meta-phosphoric acid which is absorbed by the water. Nitrogen remains in the jar in combination with a small quantity of carbonic acid, which may be removed by agitating it with a solution of pure potassa. Or it may be procured by any other substance which will take the oxygen from the atmosphere, and leave the nitrogen.

What are the properties of nitrogen? It is colorless, devoid of taste or smell, more distinguised by negative characters than by any striking properties; non-supporter of combustion and respiration, and not combustible. Its equivalent is 14; sp. gr. 0.689; symbol N.

How many compounds does nitrogen form with oxygen? Five, besides its combination in the atmosphere, which is considered as a mechanical mixture. They are the nitrous oxide, nitric oxide, hyponitrous acid, nitrous acid, and nitric acid. The first is one atom of oxygen to one of nitrogen; the second, two of oxygen; the third, three; &c.

What is understood by the air or atmosphere? It is that mass of gaseous matter by which the earth is surrounded on all sides, and adheres to it by the force of gravity. Its pressure on the surface of the earth is equal to about 15 pounds to the square inch of surface, which renders it capable of supporting a column of water 34 feet high, and one of mercury 30 inches.

Is the pressure of the atmosphere invariably the same? No, it varies at different times, and according to the elevation above the level of the sea, as indicated by the barometer.

What are the component parts of the atmosphere? It is composed of oxygen 20 or 21 parts; and nitrogen 79 or 80 by volume; it also contains a little carbonic acid. The principal chemical properties are owing to the presence of oxygen.

How is the protoxide of nitrogen or nitrous oxide procured? By subjecting the nitrate of ammonia to heat, which

is decomposed, and the products are protoxide of nitrogen, and water.

What is the rationale of this process? The nitrate of ammonia is composed of nitric acid, and ammonia. The nitric acid is composed of one equivalent of nitrogen, and five of oxygen, and the ammonia, of one of nitrogen, and three of hydrogen, making in all two equivalents of nitrogen, five of oxygen, and three of hydrogen. By the addition of heat their relations are changed, so that the three equivalents of hydrogen unite with three of the oxygen, and form water, leaving two equivalents of oxygen, and two of nitrogen, which unite, and form the nitrous oxide.

What are the properties of nitrous oxide? It is a colorless gas, absorbable by pure water, a supporter of combustion, produces exhileration when breathed, without being followed by depression or languor.

How is the binoxide procured? By the action of nitric acid on metalic copper; the gas escapes, and may be collected over water, or mercury.

What is the rationale of this process? One portion of nitric acid is decomposed; part of its oxygen oxidizes the copper, while another part is retained by the nitrogen, forming the binoxide or nitric oxide.

What are the properties of the binoxide of nitrogen? It is a colorless gas; when mixed with any gaseous mixture containing oxygen dense suffocating acid vapors of a red or orange color are produced, which are nitrous acid, and are copiously absorbable by water. This peculiarity is a distinguishing test for nitric oxide, and is also a test for the presence of free oxygen. It is not possessed of acid properties, and is irrespirable.

How is hyponitrous acid produced? By adding binoxide of nitrogen to oxygen in excess, pure potash being present, 100 measures of oxygen combine with 400 of the binoxide, and hyponitrous acid is formed, which unites with the potash.

What are its properties? At 0° F., anhydrous liquid hyponitrous acid is colorless, and green at common temperatures, very volatile, passing off in the form of an orange vapor; on admixture with water it is converted into nitric acid, and binoxide of nitrogen.

How is nitrous acid obtained? By introducing 200 measures of binoxide of nitrogen into a dry exhausted glass

vessel, with 100 of oxygen; also by subjecting the nitrate of lead, carefully dried, to a red heat.

What are its properties? Its vapor is of an orange red color, irrespirable, has acid properties, is absorbed by water, the binoxide of nitrogen being disengaged, and nitric acid remains in the water. Its vapor may be condensed by a freezing mixture, into a liquid, in which state, it is anhydrous acid, and pungent to the taste, gives a yellow stain to the skin, and is very corrosive. At 0° it is nearly colorless, and at 32° it is yellow. When mixed with a considerable quantity of water, it is instantly resolved into binoxide of nitrogen, which escapes with effervescence, and into nitric acid which unites with the water.

How may nitric acid be procured? By adding binoxide of nitrogen slowly over water, to an excess of oxygen gas. It is composed of 100 measures of nitrogen, and 250 of oxygen. For commerce it is procured by decomposing some salt of nitric acid with oil of vitriol; and common nitre or saltpetre is generally employed.

Can nitric acid exist in an insulated state? No; it exists only in combination with water, which, in its concentrated form is the nitric acid of the shops. In commerce it is generally known by the name of aqua fortis.

What are its properties? It is highly acid, largely diluted it reddens litmus paper permanently, unites with alkalies forming salts, which are called nitrates. In its purest concentrated form it is colorless, and has a specific gravity of 1.5 or 1.51. At 1.5 it contains 20 per cent. of water, for which it has a great affinity, acts powerfully on substances disposed to unite with oxygen, decomposes vegetables, the oxygen of the acid uniting with their hydrogen, forming water, and also with the carbon, forming carbonic acid. All the salts of nitric acid are soluble in water.

What are the tests for nitric acid, and the nitrates? When uncombined, it is readily detected by its strong action on copper and mercury, emitting ruddy fumes of nitrous acid.

Another, is to mix the supposed nitric acid, or nitrate, with dilute sulphuric acid, add to this some pure zinc, and set fire to the hydrogen as it is evolved; if nitric acid is present the flame will have a greenish white tint, which is owing to the presence of the binoxide of nitrogen.

Another, is to add to the supposed nitrate a drop of

sulphuric acid heated in a test tube, and then add a chrystal of morphia, which, if nitric acid be present, will become of an orange-red followed by a yellow color. The sulphuric acid in this case, should also be tested previously.

Carbon.

In what form is carbon usually presented to us? In the form of charcoal.

How is it procured? By heating wood to redness in a close vessel. The volatile parts are expelled, and the carbonaceous part remains, which is called charcoal. If bones are used instead of wood, we have animal charcoal, or ivory black.

What are the properties of charcoal? It is highly combustible, hard, and brittle, conducts heat slowly, a good conductor of electricity, very refractory in the fire if the air is excluded, absorbs air, or other gases largely, and yields them again on the application of heat; the proportion, however, varying in different gases, and absorbs the odoriferous and coloring particles of animal and vegetable substances.

Animal charcoal is mostly used when we wish to decolorize fluids, by being finely pulverized, and having the fluid filtered through it. The equivalent of carbon is 6.12 sym. C.

What are the compounds of carbon and oxygen? There are two; carbonic oxide, which is one equivalent of each; and carbonic acid, which is two equivalents of oxygen, and one of carbon.

How is carbonic acid or fixed air procured? It may be expelled from common limestone, or magnesia, (which are carbonates), by the action of heat, or acids. It is also formed during respiration, fermentation, and combustion.

What are the properties of carbonic acid? It is colorless, inodorous, elastic, condensible into a liquid under a pressure of 36 atmospheres, may be frozen into a white solid, will not support respiration, or combustion, incombustible, renders lime water turbid by the formation of carbonate of lime, absorbable by water, the quantity absorbed being very much increased by pressure; and when the pressure is removed it escapes with an effervescence. The agreable lively taste of beer, porter, ale, &c., is owing to its presence. It unites with alkaline substances, and the salts so formed, are termed carbonates. It is easily displaced from all its combinations by the hydro-chloric and the stronger acids, when it escapes with effervescence.

How is carbonic oxide procured? By exposing two parts of well dried chalk and one of pure iron filings to a red heat, and washing the gas evolved with lime water, or an alkaline solution, which absorbs the carbonic acid, and leaves the carbonic oxide.

Another mode is to mix binoxalate of potash with five or six times its weight of sulphuric acid, and heat it in a retort; an effervescence soon ensues, which is a mixture of carbonic acid and carbonic oxide, and may be separated in the same manner as in the preceding process.

What is the rationale of this last process? Oxalic acid is a compound of equal parts of the elements of carbonic acid and carbonic oxide, and they cannot exist in the form of oxalic acid, unless in combination with water, or some other substance. The sulphuric acid then unites with both the potassa and water of the binoxalate, and the oxalic acid being thus set free, is decomposed.

What are the properties of carbonic oxide? It is colorless, insipid, has no acid properties, inflammable, burning with a lambent blue flame, and irrespirable.

Sulphur.

In what form do we generally find sulphur? It is found in the region of volcanoes, generally in a massive state, sometimes crystalized; it is also found combined with the metals, such as silver, copper, antimony, lead, and iron. From its combination with iron, which is called iron pyrites, it may be procured in large quantities by exposure to a red heat in a close vessel, when it is sublimed.

What are the properties of sulphur? It is solid, brittle, of a greenish yellow color, has a peculiar odor when rubbed, tasteless, crystallizable, a non conductor of electricity, negatively electrified by friction, fused at 216° F.; if the temperature is raised to 320° it thickens and acquires a reddish tint, at 428° to 482° it is so tenacious that the vessel may be inverted without causing it to change its place, if raised still higher to its boiling point it again becomes liquid; at the temperature of 428° if poured into water it becomes ductile. It is volatile at 550° to 600°, and is condensed unchanged at lower temperatures. Its equivalent is 16.1; symbol S; specific gravity 1.99.

What are the compounds of sulphur and oxygen. There are four: sulphurous acid, which is 1 eq, of sulphur, and 2

eq. of oxygen: sulphuric acid, which is 1 eq. of sulphur, and 3 eq. of oxygen: hyposulphurous acid, which is 2 eq. of sulphur, and 2 eq. of oxygen: and the hyposulphuric acid, which is 2 eq. of sulphur to 5 eq. of oxygen.

What are the properties of sulphurous acid? It is gaseous, colorless, transparent, has a pungent suffocating odor, an acid taste, and bleaching properties; it reddens litmus, at first, and then bleaches it. It has a strong affinity for oxygen, and will precipitate metals which have a weak affinity for oxygen from their solutions. It combines with metalic oxides, and forms salts called sulphites.

How is it procured? It is formed by the combustion of sulphur in the atmosphere or dry oxygen gas; it is also evolved mixed with carbonic acid when combustible substances containing carbon are heated with strong sulphuric acid; and by heating sulphuric acid with most of the metals; with copper and mercury particularly, it yields a very pure gas. It may be obtained liquid, by transmitting dry pure gas through a glass tube surrounded by a freezing mixture. When exposed to cold in a moist state a crystalline solid is formed.

How is sulphuric acid procured? One method is to subject to a strong heat the sulphate of iron, (copperas or green vitriol;) the sulphuric acid of the salt passes over in combination with the water which it contains.

Procured in this way it is called the fuming sulphuric acid of Nordhausen, on account of the white vapors which it emits on exposure to the air, and from the place in Germany where it is manufactured.

Anhydrous sulphuric acid may be procured from this by heating it gently in a retort, and surrounding the receiver adapted to it with a mixture of snow and salt, in which it is condensed into a white crystalline solid.

The most common process for procuring sulphuric acid is to burn sulphur mixed with ⅛ its weight of nitrate of potash, in a furnace arranged so that the current of air, supporting combustion will conduct the products into a leaden chamber containing water, which becomes saturated with the sulphuric acid formed in the process.

What is the rationale of this process? The nitric acid of the nitre yields oxygen to a portion of sulphur, and converts it into sulphuric acid, which combines with the potassa of the nitre; at the same time the greater part of the sul-

phur forms sulphurous acid by uniting with the oxygen of the air.

The nitric acid by yielding a portion of its oxygen to the sulphur, is converted into binoxide of nitrogen; which coming in contact with the air at the moment of its separation is converted into red nitrous acid vapors. The gaseous product in the leaden chamber therefore is sulphurous, and nitrous acids, atmospheric air and watery vapor. From these elements a crystalline compound is formed consisting of sulphuric acid, hyponitrous acid and water; and when this solid comes in contact with the water of the chamber it is decomposed, the sulphuric acid is absorbed by the water, and nitrous acid, and binoxide of nitrogen escape, the latter of which coming in contact with the air, is converted into nitrous acid. This nitrous acid is again intermixed with sulphurous acid and aqueous vapor, and gives rise to a second portion of the crystalline compound which undergoes the same changes as the first.

What are the properties of sulphuric acid? As usually obtained it is a dense, colorless, oily fluid; boils at 620°; specific gravity 1.847; very corrosive; sour, reddens litmus, and separates all other acids from their union with the alkalies. Chloride of barium is a test for it, and will form a white precipitate, the sulphate of baryta.

Phosphorus.

How is phosphorus procured? By igniting bones in an open fire until all the animal matter is destroyed, leaving only a white substance, which is principally the phosphate of lime; reduce this to a fine powder, and digest with strong sulphuric acid and water, sufficient to give the consistence of a thin paste. The phospahte of lime is decomposed; a sulphate, and a soluble super-phosphate of lime is formed. The super-phosphate of lime is to be dissolved in warm water, and separated from the sulphate by filtration, and evaporated to the consistence of syrup, then mixed with ¼ its weight of powdered charcoal, and heated in an earthen retort, with the beak of the retort put into water, in which the vapor of the phosphorus is condensed, of a reddish brown color, owing to the presence of the phosphuret of carbon. It may be purified by a second distillation.

What is the rationale of this process? When the superphosphate of lime and charcoal are mixed, and heat applied,

the oxygen of that part of the phosphoric acid which constitutes the superphosphate unites with the charcoal and forms carbonic acid, and carbonic oxide gases; phosphorus is distilled over, and phosphate of lime with redundant charcoal remains in the retort.

What are the properties of phosphorus? It is colorless, and transparent when pure; a soft solid at ordinary temperatures, has a waxy lustre when cut with a knife, distills at 550°, very inflammable, undergoes slow combustion at common temperatures when exposed to the air, and emits a white vapor of an alliaceous odor. Its equivalent is 15.7; symbol P; and sp. gr. 1.77.

What are the compounds of phosphorus and oxygen? The oxide of phosphorus, consisting of three equivalents of phosphorus, and one of oxygen; the hypophosphorus acid, 2 eq. of phosphorus to 1 of oxygen; the phosphorus acid, 2 eq. of phosphorus to 3 of oxygen; and the phosphoric, pyrophosphoric, or metaphosphoric acid, which is 2 eq. of phosphorus and 5 eq. of oxygen.

How is phosphoric acid procured? By decomposing phosphate of baryta with sulphuric acid.

What are its properties? It is viscid, inodorous, colorless, liquid, reddens vegetable blues, and when heated to redness corrodes glass or porcelain.

What is paraphosphoric or metaphosphoric acid? It is formed when phosphoric acid is heated to redness and allowed to cool Paraphosphoric, metaphosphoric and pyrophosphoric acid are isomeric bodies because they consist of the same proportions of the same elements but differ in properties.

Boron.

How is boron procured? It was first obtained by subjecting boracic acid to the action of a powerful galvanic battery. But it may be procured in larger quantities by heating boracic acid with potassium, by which the boracic acid is deprived of its oxygen, and the boron liberated.

What are the properties of boron? It is of a dark olive color, has neither taste nor smell, and is a nonconductor of electricity. It is not soluble in water, alcohol, ether, or oils, does not decompose water, bears a strong heat in close vessels without fusing, or being changed, except that its density is increased. If heated to 600° it takes fire, oxygen disap-

pears, and boracic acid is formed. Its equivalent is 10.9; symbol B; sp. gr. about 2.

What are the compounds of boron and oxygen? Boracic acid is the only compound of boron and oxygen.

Where is it found and how is it procured? It is found as a natural product in some of the hot springs, and is a constituent of datolite, boracite, and borax, which is a compound of boracic acid and soda. It is procured by adding sulphuric acid to a solution of purified borax in four times its weight of boiling water. The sulphuric acid unites with the soda and the boracic acid is deposited on cooling in crystals which may be purified by washing, dissolving them in boiling water and by recrystalization.

What are the properties of boracic acid? In crystals it is a hydrate, slightly soluble in water, very soluble in alcohol, and the solution when set on fire burns with a green flame which is a sure test for the presence of boracic acid; sp. gr. 1.479. inodorous, bitter taste, reddens litmus, and with alkaline carbonates produces effervesence. In its hydrous state if gradually exposed to a high heat its water of crystalization is expelled and a fused mass remains, which will bear a white heat without sublimation, and on cooling forms a hard transparent glass which is anhydrous boracic acid. It absorbs water, and looses its transparency if exposed to the air. It is sometimes used as a flux from its being very fusible and communicating this property to other substances.

Silicon.

How is silicon procured? It was first procured by Berzelius, by the action of potassium on fluo-silicic acid gas; but a more convenient process is from the double fluoride of silicon, and potassium, or sodium, previously dried, and placed in a glass tube with potassium, to which a spirit lamp is applied. The potassium uniting with the fluorine and the silicon is set at liberty. To render it perfectly pure it should then be heated to redness, and digested in dilute hydrofluoric acid.

What are the properties of silicon? It is of a dark nut brown color, without metalic lustre non-conductor of electricity, incombustible, not dissolved or oxydized by sulphuric, nitric, hydrochloric or hydrofluoric acids; but nitric and hydrofluoric acids mixed dissolve it readily. Its equivalent is 22.5; symbol Si.

What is the composition of silicic acids? In 100 parts there are 48.4 of silicon, and 51.6 oxygen, by weight.

Where is the silicic acid found, and how is it procured? It exists in great profusion in nature, under the names of silica and silicious earths. It forms a part of many minerals, and under the name of quartz forms mountainous masses. It is the principal ingredient in sand stones, flint, calcedony, &c., &c. It may be procured by igniting pure rock chrystal, throwing it while red hot into water, and reducing it to a fine powder.

What are the properties of silicic acid? As procured above it is a light white powder, feels rough and dry when rubbed between the fingers, insipid and inodorous; sp. gr. 2,69. It is very fixed in the fire, but may be fused by the hydro-oxygen blow pipe, insoluble in water, does not affect tests for acids, but in its chemical combinations acts the part of an acid, and displaces carbonic acid from the alkalies by the aid of heat. The nature of its combinations with the alkalies depends upon the proportions in which they are united. One of these combinations which is one part silicic acid, and three of carbonate potassa, is deliquescent and easily dissolved in water, in this condition it has been called the liquor of flints or liquor silicum.

By reversing the proportions the result is the well known article glass. Every kind of glass is a compound of silicic acid with a base, or bases; therefore a silicate. The quality generally depending upon the purity of the materials, and in flint glass, besides the pure silicic acid and alkali, there is added some of the oxides of lead; it is therefore a double salt, composed of bisilicate of potassa, and bisilicate of oxides of lead. It equivalent is 46.5.

Selenium.

How is selenium formed, and how is it procured? It generally occurs in combination with iron pyrites, also in some volcanic products, as a sulphuret, and it is sometimes found combined with several of the metals. It may be obtained from the sulphuret by mixing it with eight times its weight of peroxide of manganese, and exposing the mixture to a low red heat in a glass retort, the beak of which extends into water. The sulphur is oxidized by the oxide of manganese, and the selenium is sublimed.

What are its properties? It is a brittle opaque solid,

having neither taste or odor, of a metalic lustre when in mass, and when in powder of a deep red color. It softens at 212°, and may be drawn into fine threads; conducts heat and electricity imperfectly, and is insoluble in water. Exposed to the flame of a blow pipe it colors the flame of a light blue color, and exhales a strong odor of decayed horse radish; which may be considered as characteristic of the presence of selenium, whether alone or in combination. Its equivalent is 39.6; symbol Se.

What are the compounds of selenium and oxygen? There are three; the oxide of selenium, which is 2 eq. of selenium to 1 of oxygen; selenious acid, 1 eq. selenium to 2 of oxygen; and selenic acid, 1 eq. selenium to 3 of oxygen. The selenic acid is analagous in composition, and many of its properties, to sulphuric acid, and that similarity extends also to their compounds with alkaline substances.

Chlorine.

How is chlorine gas obtained? By the action of hydrochloric or muriatic acid, and the peroxide of manganese in the proportion of two parts of the former to one of the latter; the chlorine escapes with effervescence, without the application of heat; but much more rapidly when heat is applied.

What is the rationale of this process? The hydrochloric acid consists of chlorine 2 eq., and hydrogen 2 eq.; the oxide of manganese consists of manganese 1 eq., and oxygen 2 eq. In the reaction which takes place 1 eq. of chlorine unites with the 1 eq. of manganese, forms the chloride of manganese, and 1 eq, of chlorine is set at liberty; and the 2 eq. of oxygen and 2 eq. of hydrogen unite and form water, So that the result is chloride of manganese, water, and chlorine, which is set at liberty.

What are the properties of chlorine gas? It has a yellowish green color, astringent taste, and disagreeable smell. It is irrespirable even if largely diluted with air, and emits heat and light when strongly compressed. By the application of about four atmospheres of pressure, it becomes a limpid liquid of a bright yellow color. It is absorbable by water, which yields it when heated. It presents the phenomena of combustion when brought in contact with some substances, and the result is a chloride, or an acid containing chlorine. It has a very strong affinity for hydrogen, is

negatively electric, has no acid properties, has a great affinity for metals, and a powerful bleaching property. In its application to bleaching the presence of water is necessary, and hydrochloric acid is generated during the process; from which we infer that the water is decomposed, the hydrogen uniting with the chlorine, and the oxygen is liberated, which occasions the bleaching. The compounds of chlorine which are not acid are termed chlorides. The test for chlorine is nitrate of the oxide of silver, which produces a white precipitate. Its equivalent is 35.42; symbol Cl; sp. gr. 2.47.

What compound does chlorine form with hydrogen? It forms the hydrochloric or muriatic acid, which is 1 eq. of chlorine to 1 of hydrogen.

How may this acid be prepared? In a gaseous state it may be procured by putting a strong liquid solution of the acid into a glass, and heating it until it boils, when the gas is evolved, and may be collected over mercury. Another method is to mix equal weights of liquid sulphuric acid and sea salt, and apply heat.

What is the rationale of these processes? In the former the acid dissolved in water is simply expelled by heat.

In the latter the water is decomposed, its oxygen unites with the sodium of the chloride of sodium or sea salt, and forms soda; the hydrogen unites with the chlorine and forms the hydrochloric acid which escapes, and the sulphuric acid unites with the soda. The water in this process is supplied by the sulphuric acid. The result therefore is sulphate and bisulphate of soda, and hydrochloric acid.

Under what circumstances will the elements of hydrochloric acid when brought into contact unite? When an electric spark is passed through the mixture, by the presence of flame, a red hot body, or spongy platinum. By exposure to diffused light they unite slowly, but the direct solar rays like electricity, flame, &c., produce a sudden inflammation accompanied with an explosion.

In what manner is the acid procured in a liquid state? By passing a current of gas into water as long as any of it will be absorbed, we procure a concentrated aqueous solution.

What are the properties of hydrochloric acid? In a gaseous state it is colorless, has a pungent odor, and an acid taste. In a temperature of 50°, and under a pressure of 40 atmospheres, it is liquid. It is irrespirable, incombustible,

and a non supporter of combustion. Heat will not alter it chemically, but galvanism will decompose it; hydrogen will be found at the negative pole, and chlorine at the positive. It has a powerful attraction for water, which causes a white cloud to appear, where it is liberated into the atmosphere, owing to its combination with the aqueous vapor; ice, also liquifies instantly, if introduced into a jar containing it, and the gas is rapidly absorbed. On introducing a jar containing the gas into water, the absorption takes place so rapidly, that the water is forced up with the same rapidity as if it were a vacuum. During the absorption, heat is given out.

How can we determine the quantity of this acid contained in its solutions? By ascertaining the quantity of pure marble dissolved by a given weight of each. Every 50.6 grs. of marble correspond to 36.42 of real acid.

What are the properties of the hydrochloric acid of commerce? It has a yellow color, and contains impurities, which are usually nitric and sulphuric acid, and the oxide of iron. If pure, it is a colorless, liquid, emits white vapors if exposed to the air, very sour, reddens litmus, and neutralizes alkalies. It freezes at 60°, and boils at 110° giving off the pure hydrochloric acid gas freely.

It is decomposed by substances yielding oxygen easily.

What combination of hydrochloric acid is used in dissolving gold, and platinum? It is a mixture of two parts of the hydrochloric, and one of the nitric acids, and is commonly termed aqua regia.

What chemical action takes place in forming a solution of gold by this mixture? The nitric and hydrochloric acids decompose each other, and produce water, nitrous acid, and chlorine; the solvent power is dependent on the chlorine, which is liberated.

What are the compounds of chlorine, and oxygen? They are; the hypochlorous acid, 1 eq. by weight of each, the chlorous acid; 1 eq. chlorine to 4 oxygen; the chloric acid, 1 eq. chlorine to 5 oxygen; and the perchloric acid, 1 eq. chlorine to 7 oxygen.

How is hypochlorous acid procured? Hypochlorous acid, or euchlorine, may be best procured by pouring peroxide of mercury in fine powder, and mixed with twice its weight of distilled water, into bottles filled with chlorine gas. By agitation, the chlorine is completely absorbed. The oxide of mercury is decomposed, both its constituents combining

with chlorine, the mercury forming corrosive sublimate, and the oxygen hypochlorous acid. The acid may then be separated by distillation, which should be done at a temperature below 212°, as it is decomposed at that heat; or it may be best performed under reduced pressure. The acid thus procured, may be concentrated by a second distillation.

What are the properties of hypochlorous acid? It is a transparent liquid of a slightly yellow color when concentrated; has a strong penetrating odor, an exceedingly active action on the skin, similar, but greater than that of nitric acid; high bleaching properties, when concentrated very liable to be decomposed, chlorine being evolved, and chloric acid produced; this effect is promoted by light, and produced instantly by the direct rays of the sun; also, by agitation with angular bodies; a portion of pounded glass produces brisk decomposition, when thrown into this acid. It is a powerful oxidizing agent, particularly of the non metalic elements which are readily brought to their highest degree of oxidation.

How is chlorous acid procured? By making 50 or 60 grains of chlorate of potassa into a paste with strong sulphuric acid, putting it into a glass retort, and applying heat by means of warm water kept below 212°, when a gas of a bright yellowish green color is disengaged, which has an aromatic odor without the smell of chlorine, and is rapidly absorbed by water, to which it imparts its tint. This gas is the chlorous acid.

What is the rationale of this process? The sulphuric acid decomposes a part of the chlorate of potassa, and liberates chloric acid, which at the moment of separation resolves itself into chlorous acid, and oxygen; the last of which passes over to the acid of the undecomposed chlorate of potassa, and is converted into perchloric acid. The resulting compounds are bisulphate, and perchlorate of potassa, and chlorous acid.

What are the properties of chlorous acid? It unites with alkalies, and alkaline earths, forming salts soluble in water, and having bleaching properties. Phosphorus takes fire with an explosion when introduced into this gas. A temperature of 212° causes a violent explosion.

How is chloric acid procured? To a dilute solution of chlorate of baryta add weak sulphuric acid precisely sufficient for combining with the baryta; an insoluble sulphate

of baryta is formed, and precipitated; and pure chloric acid remains in the liquid.

What are the properties of chloric acid? It reddens vegetable blue colors, has a sour taste, and forms neutral salts with alkaline bases called chlorates. It has no bleaching properties, a circumstance which distinguishes it from chlorine, hypochlorous acids, and chlorous acids. It does not give a precipitate with a solution of the nitrate of silver. It may be concentrated by a gentle heat to an oily consistence. In this highly concentrated state it has a yellowish tint, an odor of nitric acid, sets fire to dry organic matter, and converts alcohol into acetic acid.

It is easily decomposed by deoxidizing agents.

It may be distinguished by forming a salt with potassa, which crystalizes in tables, has a pearly lustre, deflagrates like nitre, when thrown on burning charcoal, and yields chloric acid by the action of concentrated sulphuric acid.

How is perchloric acid procured? By adding dilute sulphuric acid to perchlorate of potassa, and applying heat to the mixture; white vapours arise that condense as a colorless liquid in the receiver which is a solution of perchloric acid. It may be obtained in a solid form by mixing it with strong sulphuric acid and distilling. It hisses when thrown into water, similar to red hot iron; forms a compound with potassa very slightly soluble in water, which is the perchlorate of potassa, and may be distinguished from the chlorate by not becoming yellowish on the application of hydrochloric acid. The primary form of its chrystal is a right rhomboidal prism.

How is the quadro-chloride of nitrogen procured? Dissolve an ounce of hydrochlorate of ammonia in 12 or 16 ounces of hot water; when it has cooled to 90° invert a wide mouthed glass bottle full of chlorine into it. The chlorine is absorbed, it acquires a yellow color, and in a few minutes globules of a yellow fluid float like oil upon its surface; when they acquire the size of a small pea they sink to the bottom of the liquid, and should be collected in a leaden saucer placed under the mouth of the bottle.

What is the rationale of this process? The ammonia is decomposed by the chlorine, hydrochloric acid is generated by the hydrogen of the ammonia uniting with a part of the chlorine, while the nitrogen of the ammonia unites with another part of the chlorine.

What are the properties of the quadro-chloride of nitrogen? It is one of the most explosive compounds known. It is not congealed by a mixture of snow and salt, may be distilled at 160°, explodes between 210° and 212°, contact with some combustibles causes detonation at common temperatures, particularly oils, both volatile, and fixed. The products of the explosion are chlorine and nitrogen. This compound is 4 eq. of chlorine to 1 of nitrogen, or as stated by Berzelius 3 eq. chlorine to 1 of nitrogen.

What are the compounds of chlorine with carbon? The perchloride of carbon which consists of 2 eq. of carbon and 3 of chlorine; the protochloride of 1 eq. of chlorine, and 1 of carbon, and the dichloride of 2 eq. of carbon, and 1 of chlorine.

How is perchloride of carbon procured? By exposing olefiant gas to chlorine; a combination takes place between them, and an oily liquid is generated, which is a compound of carbon, hydrogen, and chlorine. Put this into a vessel containing chlorine gas, and expose it to the direct rays of the sun; the chlorine decomposes the liquid, hydrochloric acid is liberated, and the carbon unites with the chlorine at the moment of separation.

What are the properties of the perchloride of carbon? It is solid at common temperatures, has an aromatic odor, a nonconductor of electricity, and a powerful refractor of light; sp. gr. 2; fuses at 320°; it may be distilled without change, and assumes a crystalline form when it condenses.

How is the proto-chloride of carbon procured? By passing the vapor of perchloride through a red hot glass tube filled with pieces of rock crystal it is partially decomposed; chlorine, and protochloride of carbon being the result.

What are the properties of proto-chloride of carbon? It is a limpid colorless liquid, has a density of 1.55, does not congeal at 0°, and is converted into vapor at 160° or 170°. It may be distilled, but exposure to a red heat resolves it into its elements.

What are the characteristics of the dichloride of carbon? It is of a white color, in the shape of small, soft, adhesive fibres, and has a peculiar odor resembling spermaceti.

What are the compounds of chlorine and sulphur? The dichloride which contains 2 eq. of sulphur, and 1 of chlorine; and the proto-chloride which is 1 eq. of chlorine and 1 of sulphur.

What are the compounds of chlorine and phosphorus? The perchloride of phosphorus which is 5 eq. of chlorine and 2 of phosporus, and the sesqui-chloride of phosphorus, which is 3 eq. of chlorine, and 2 of phosphorus.

How is the perchloride of phosphorus procured. By inflaming phosphorus in dry chlorine the perchloride collects inside of the vessel. It is white and very volatile. By heating it under pressure and cooling, it yields transparent prismatic crystals.

How is the sesqui chloride of phosphorus procured? By heating the perchloride with phosphorus; also by passing the vapor of phosphorus over corrosive sublimate contained in a glass tube.

What are the properties of the sesqu-ichloride of phosphorus? It is a clear liquid, like water, of sp. gr. 1.45, emits acid fumes when exposed to the air owing to the decomposition of aqueous vapor. On mixing with water a mutual decomposition takes place, heat is evolved, and a solution of hydrochloric and phosphorous acids is obtained.

How is chloro-carbonic acid or phosgene gas procured? By exposing equal parts by measure of chlorine, and carbonic oxide gases to sunshine, a combination ensues, and a contraction to half the volume takes place.

What are the properties of chloro-carbonic acid gas? It is colorless, has a strong odor, and reddens dry litmus paper, combines with gaseous ammonia, and forms a white solid salt, therefore has acid properties. Water decomposes it, and the result is hydrochloric and carbonic acids.

What compound does chlorine form with boron? It forms the ter-chloride; and it is procured by putting recently prepared boron into chlorine, when it takes fire spontaneously, and a colorless gas, the chloride of boron is formed, which is absorbable by water, and undergoes double decomposition at the same moment, the result of which is hydrochloric and boracic acids.

What compound does chlorine form with silicon? The ter-chloride, which may be procured by heating silicon in a current of chlorine gas. The product is condensed into a colorless liquid, which by the addition of water is converted into hydrochloric and silicic acids.

Is chlorine a simple or compound substance? It is generally believed to be a simple body because it cannot be decomposed by any known means.

Iodine.

Where is iodine found? It is found in many mineral springs in combination with sodium and potassium; it is also found in the water of the Mediterranean, in the oyster, and some other marine molluscous animals, in sponges, and in most kinds of sea-weed. It has also been found in the mineral kingdom in combination with silver.

How is it procured? It is procured from kelp, an impure carbonate of soda, obtained by incinerating sea weeds. Carbonate of soda is prepared from the kelp; and the residual liquor contains iodine in combination with potassium or sodium, which may be separated by the addition of sulphuric acid; by the application of heat the iodine is then sublimed, and may be collected in cool glass receivers.

What are the properties of iodine? It is a soft, friable, solid, has a bluish color, metallic lustre, and crystalline appearance, resembling micaceous iron ore. It is fused at 225° and ebullition takes place at 347°. If moisture is present it is sublimed rapidly at a temperature below boiling water. Its vapor is of a rich violet color, from which it derives its name.

It is a non-conductor of electricity, and negatively electric. It is very sparingly soluble in water, but very soluble in alcohol and ether. It has a strong affinity for the metals and most of the non-metalic combustibles, producing compounds termed iodides.

The test for iodine is starch; but the iodine must be in a free condition, and the solution cold. Its equivalent is 126.3; symbol I; sp. gr. 3.

What compound does iodine form with hydrogen? It forms the hydriodic acid which is 1 eq. of iodine to 1 eq. of hydrogen.

How is hydriodic acid procured? It may be formed by the direct union of hydrogen with the vapor of iodine transmitted through a porcelain tube at a red heat. It may also be procured by the action of water on the periodide of phosphorus, which gives the phosphoric and hydriodic acids, the latter of which passes over as a colorless gas.

What are the properties of hydriodic acid gas? It has a sour taste, reddens vegetable blue colors, and produces white fumes when mixed with the air.

Its salts are called hydriodates.

What are the compounds of iodine with oxygen? The oxide of iodine, iodous acid, iodic, and periodic acid.

How is the oxide of iodine and iodous acid procured.

By mixing the vapor of iodine and oxygen gas considerably heated, a yellow matter of the consistence of solid oil is produced, which is regarded as the oxide of iodine; and if the supply of oxygen be continued it is converted into a yellow liquid which is the iodous acid.

How is the iodic acid procured? By bringing iodine in contact with euchlorine, the chlorine unites with a portion of iodine, and the oxygen with another portion, and chloride of iodine and iodic acid is the result.

They may be separated by applying heat; the chloride passes over and the acid remains. Or dissolve perchloide of iodine in water, and add a large quantity of strong sulphuric acid, keep it cool, and iodic acid will be precipitated.

What are the properties of iodic acid? It is a white, semi-transparent solid, has a strong astringent sour taste, inodorous, and is anhydrous. Its compounds are called iodates.

Bromine.

How is Bromine procured? From bittern, which contains hydrobromic acid, decomposable by chlorine, the chlorine unites with the hydrogen, and liberates the bromine into the liquid, which may be expelled by heat and condensed in a tube surrounded with ice.

What are the properties of bromine? At common temperatures it is a blackish red liquid. Its odor is very disagreeable, and resembles chlorine. It is congealed at 4° and is brittle. It emits at common temperatures red colored vapors, resembling nitrous acid, and boils at 116.5°. It resembles oxygen, chlorine and iodine, in being negatively electric. It is soluble in water, alcohol and ether, supports combustion under some circumstances, and is very destructive to life. It has not been decomposed, and is very analagous in its chemical relations to iodine and chlorine. It can generally be detected by means of chlorine, which displaces bromine from its compounds. Its equivalent is 78.4; sp. gr. 2.9; symbol Br.

What compound does bromine form with hydrogen? The hydrobromic acid, and may be produced by mixing the vapor of bromine with hydriodic acid, hydrosulphuric acid,

or phosphuretted hydrogen gas, when decomposition takes place, and hydrobromic acid is formed.

What are the properties of hydrobromic acid? It is a colorless gas of an acid taste, and pungent odor, irritates the glottis, and when mixed with moist air yields white vapors. It is decomposed by chlorine, hydrochloric acid gas is produced, and bromine is deposited. The salts of hydrobromic acid are called hydrobromates.

What compounds are formed with bromine and oxygen? The bromic acid is the only known compound.

How is it procured? By decomposing a dilute solution of the bromate of baryta with sulphuric acid. The sulphate of baryta is precipitated, the bromic acid remains in solution, and may be concentrated by slow evaporation, but cannot be entirely deprived of water without being decomposed.

What are the properties of bromic acid? It has an acid taste, but not corrosive, very little odor, reddens litmus at first, and then destroys its color. It is analagous to iodic, chloric and nitric acids. Its composition is 1 eq. of bromine to 5 eq. of oxygen.

How is the chloride of bromine procured? By passing a current of chlorine through bromine, and condensing the resulting vapors by a freezing mixture.

What are the properties of chloride of bromine? It is a volatile fluid of a reddish yellow color, disagreeable taste, penetrating odor, and causes a discharge of tears from the eyes. Metals burn in its vapor, and chlorides, and bromides are formed.

What other compounds does bromine form? It forms two compounds with iodine, two with phosphorus, one with carbon, and one with silicon.

Fluorine.

How is fluorine procured? By passing fluoride of boron over minium heated to redness, and collecting the gas in a dry vessel; another mode is to mix fluoride of calcium and peroxide of manganese with sulphuric acid.

What are the properties of fluorine? It is a yellowish brown gas, resembles chlorine in odor, bleaches, is negatively electric, and has a powerful affinity for the metals and hydrogen. Its equivalent is 18.66; specific gravity 1.2; symbol F.

What compound does fluorine form with hydrogen? The hydrofluoric acid, which is 1 equivalent of fluorine to 1 of hydrogen.

How is it procured? By adding concentrated sulphuric acid to fluor spar, (which is a fluoride of calcium,) reduced to a fine powder. The acid distils over on applying heat, and must be collected in a leaden receiver surrounded with ice. The result is hydrofluoric acid which comes over, and the sulphate of lime remaining in the retort.

What are the properties of hydrofluoric acid? It is a colorless liquid at 32°; if exposed to the air it flies off in dense white fumes produced by its combination with the atmosphere; has a powerful affinity for water, and a very pungent vapor. It is the most destructive to animal matter of all known substances, its application being followed by a malignant ulcer; it corrodes glass, and fluosilicic acid gas is produced.

When diluted with three or four times it weight of water it is suitable for etching on glass. It has the properties of a powerful acid, reddens litmus, has a strong sour taste, neutralizes alkalies, forming salts called hydrofluates, or unites with metals forming compounds called fluorides.

How is fluoboric acid gas obtained? By heating a mixture of 12 parts of sulphuric acid, with 2 of fluor spar, and 1 of vitrified boracic acid, in a flask. It may also be obtained by heating hydrofluoric, and boracic acids in a metalic retort.

What are the properties of fluorboric acid gas? It is colorless, has a penetrating pungent odor, reddens litmus, and forms salts with alkalies, called fluoborates. It has a very strong affinity for water, which it will take from any gas containing aqueous vapor, thus affording a delicate test for it in gases,. Water absorbs it, and forms a stong caustic solution.

How is fluo-silicic acid procured? By mixing 2 parts of strong sulphuric acid, 1 of fluor spar, and 1 of sand, or pounded glass; on the application of heat it is disengaged, and may be collected over mercury.

What are the properties of fluo-silicic acid? It is a colorless gas, does not support combustion, destroys animal life, and unites with the watery vapor of the atmosphere, forming a white cloud.

Ammonia.

What is the composition of ammoniacal gas? It is a compound of nitrogen; one equivalent to three of hydrogen.

How is it procured? It may be procured from any salt of ammonia by the action of a pure alkali, or alkaline earth. Equal parts of the hydrochlorate of ammonia, and caustic lime are generally employed; heat is applied, the ammonia is given off, and the residue is chloride of calcium and lime, the lime being added in excess. A highly concentrated solution of ammonia is obtained by transmitting a current of the gas into water, as long as it will absorb it. To exhibit the gas pure, it must be collected over mercury.

What are the properties of ammonia? In a gaseous form it is colorless, powerfully pungent, irritates the eyes, and nose, irrespirable when pure, a non supporter of combustion, slightly combustible in oxygen gas, and a mixture with oxygen detonates by the electric spark, water being formed, and nitrogen set free. The gas may be liquified at a temperature of 50 °, and under a pressure of 6.5 atmospheres, forming a transparent colorless liquid. It is highly alkaline, forms salts decomposable by being heated with the fixed alkalies, or alkaline earths, or by a red heat. If combined with a volatile acid, the compound may be sublimed unchanged. It has a powerful affinity for water, which absorbs 780 times its bulk, the sp. gr. of which, is diminished to 0.936. The liquid solution is clear, colorless, and possesses the peculiarities of the gas itself.

How may free ammonia be detected? By the odor, its temporary action on turmeric paper, which it stains brown, and the color soon reappears owing to its volatility; and by its forming dense fumes when a glass rod moistened with hydrocloric acid, is brought near it; these white fumes are the hydrochlorate of ammonia.

Compounds of Hydrogen and Carbon.

What are the known compounds of hydrogen and carbon? Light carburetted hydrogen, olefiant gas, etherine, paraffine, eupione, rose oil stearine, wax oil, benzin, naphtha, oil of turpentine, citrine, camphine, oil of copaiva, juniper oil, lemon oil, savin tree oil, black pepper oil, naphthaline, paranaphthaline, and idrialine.

What is the proper chemical name for light carburetted hydrogen? The dicarburet of hydrogen. Other names fre-

quently used, are heavy inflammable air, the inflammable air of marshes, and hydrocarburet.

Where is it found, and how is it obtained? It is formed in stagnant pools, from the decomposition of vegetable matter, and may be procured by stirring the mud at the bottom, and collecting it in inverted vessels as it rises. Obtained in this way it contains a small quantity of carbonic acid gas.

What are its properties? It is colorless, tasteless, has very little smell, gaseous, a non supporter of combustion, or respiration, inflammable, and burns with a yellow flame. With a sufficient portion of atmospheric air, or oxygen, it forms a detonating compound, water and carbonic acid being formed when it is detonated.

The fire damp, so destructive in coal mines when ignited, is composed of this gas.

Upon what principle is Sir Humphrey Davy's safety lamp constructed to prevent the explosion of this gas? It is found that the flame cannot pass through a narrow tube, however short, provided its diameter is sufficiently reduced. Now a piece of wire gauze may be regarded as an assemblage of these tubes, and flame will not penetrate it; therefore, if a common oil lamp is surrounded with a piece of this gauze, it will burn in the explosive mixture, without communicating combustion to the gas externally.

What is the composition of olefiant gas, and why is it so called? It is composed of 2 eq. of carbon, and 2 eq. of hydrogen, united to form 1 eq. of the gas; and is called olefiant gas because it forms an oil-like liquid with chlorine.

How is it procured? By heating a mixture of alcohol and sulphuric acid, in the proportion of one part of the former, to four of the latter; effervescence ensues, and olefiant gas passes over.

What are the properties of olefiant gas? It is colorless, tasteless, and inodorous, a non supporter of combustion, and respiration, inflammable, burning with a dense white light, and forms an explosive mixture with oxygen, or atmospheric air. It is decomposed by a succession of electric sparks, and by being transmitted through red hot porcelain tubes. A mixture of 2 parts chlorine, and 1 of olefiant gas, takes fire on the application of flame, the result of which, is hydrochloric acid, and the deposition of charcoal; but if they are allowed to remain at rest, they enter into direct combination, and a yellowish oil is produced.

Upon what does the flame of candles, lamps, gas lights, culinary fires, &c., depend? The compounds of carbon, and hydrogen.

How may they be procured for the purpose of gas lights? By the destructive distillation of bituminous coal, wood, oil, tar, or other inflammable substances.

Upon what does the illuminating power of these compounds principally depend? This power is in proportion to the quantity of carbon condensed into a volume, provided there is a sufficient supply of oxygen to consume it; otherwise the excess of carbon renders the flame smoky.

Hydrogen and Sulphur.

What are the compounds formed by hydrogen and sulphur? There are two; hydrosulphuric acid, which is 1 eq. of hydrogen, and 1 eq. of sulphur; and the persulphuret of hydrogen, which is 1 eq. of hydrogen, and 2 eq. of sulphur.

How is hydrosulphuric acid, or sulphuretted hydrogen as it is generally called, procured? By heating sesquisulphuret of antimony with four or five times its weight of hydrochloric acid.

What is the rationale of this process? The chlorine of the hydrochloric acid unites with the antimony of the sesquisulphuret forming a sesquichloride, and the hydrogen of the hydrochloric acid unites with the sulphur of the sesquisulphuret, and forms hydro-sulphuric acid.

What are the properties of hydrosulphuric acid? It is a colorless gas, reddens moist litmus, has a very offensive taste and odor, similar to putrid eggs, a non supporter of respiration, and combustion, combustible, water and sulphuric acid being the products, and sulphur is deposited. It may be readily distinguished by its odor, tarnishing silver, and the character of its precipitate with solutions of arsenious acid, tartar emetic, or salts of lead. Its salts are called hydrosulphates.

Hydrogen and Phosphorus.

How is phosphuretted hydrogen procured? By the action of strong hydrochloric acid on phosphuret of calcium.

What are its properties? It is a transparent, colorless gas of an offensive odor, and bitter taste, it is a non supporter of combustion and animal life. It detonates with oxygen at the temperature of 300°, by the electric spark, and by diminished pressure.

If the beak of a retort from which this gas issues is plunged under water so that bubbles of it may rise through the liquid, each one on reaching the surface will burst into a flame, and form a ring of dense white smoke, which enlarges as it ascends, presenting a beautiful appearance characteristic of this gas.

Nitrogen and Carbon.

What compound is formed between nitrogen and carbon? Cyanogen or bicarburet of nitrogen.

How is cyanogen procured? By heating bicyanide of mercury in a porcelain retort, and collecting the product over mercury.

What are the properties of cyanogen? It is a colorless, transparent, irrespirable gas. It is limpid, liquid at the temperature of 45°, and under a pressure of 3.6 atmospheres. It will not support combustion, but burns with a beautiful flame. It is carbon 2 eq, and nitrogen 1 eq. It has a strong tendency to unite with elementary substances.

What compound is formed by cyanogen, and hydrogen? Hydrocyanic, or prussic acid.

In what does this acid exist in nature? In the leaves of laurel, and peach trees, and in the kernels of several fruits.

How is it obtained, and what are its properties? By the action of hydrochloric acid upon bicyanide of mercury. It is colorless, liquid, has an odor resembling peach leaves, very volatile, highly poisonous, and possesses slight acid properties.

METALS.

What are the characteristics of metals? They are conductors of electricity, and heat, electro-positive, opaque, generally good reflectors of light, and possess a peculiar lustre called metalic.

What is the number of the metals? Forty-one.

What metals possess the property of malleability? Gold, silver, copper, tin, platinum, cadmium, lead, zinc, iron, nickel, potassium, sodium, and frozen mercury.

What are the metals which possess the property of ductility? Gold, silver, iron, and copper are the only ones capable of being drawn into wires with facility.

What is meant by the term calx? It is the product of the oxidation of a metal when heated in the air.

What is meant by the reduction of a metal? It is the process by which metalic compounds are changed to their metalic state.

What are the means used in reducing metals? Heat, the united agency of heat and combustible matter, the galvanic battery, and by the action of deoxidizing agents on their solutions.

What are the oxides of metals called which are capable of uniting with acids and forming salts? They are called alkaline or salifiable bases and are generally the protoxide.

Have metals an affinity for chlorine? They have a powerful affinity, and in many instances unite so as to present the phenomena of combustion; and will frequently displace oxygen from its union with the metals.

What are the general characteristics of the metalic chlorides? Most of them are solid at common temperatures, fusible by heat, and crystalize on cooling. Some of them may be sublimed without change, they are for the most part colorless, have no metalic lustre, and have the appearance of salts.

Have the metals an affinity for iodine? They have a strong affinity, and most of these compounds are not decomposible by a red heat in close vessels.

Have the metals an affinity for sulphur? They have a strong tendency to unite with it, and the union may be accomplished by heating the metal with sulphur, by igniting a mixture of a metallic oxide and sulphur, and by several other processes.

How are the metals divided? Into two classes.

Class 1st. Those which yield alkalies and earths by oxidation. Class 2nd. Those the oxides of which are neither alkalies or earths.

The 1st class comprises twelve metals which have been arranged into three orders.

Order 1st. The metalic bases of the alkalies. They are potassium, sodium and lithium.

Order 2nd. The metalic bases of the alkaline earths.—These are barium, strontium, calcium and magnesium.

Order 3d. The metalic bases of the earths. They are aluminum, glucinum, yttrium, thorinum and zirconium.

The 2nd class comprises twenty-nine metals, and may be arranged into three orders.

Order 1st. The metals which decompose water at a red

heat. They are manganese, iron, zinc, cadmium, tin, cobalt and nickel.

Order 2nd. The metals which do not decompose water at any temperature, and the oxides of which are not reducible to a metalic state by heat alone. They are arsenic, chromium, vanadium, molybdenum, tungsten, columbium, antimony, uranium, cerium, bismuth, titanium, tellurium, copper, and lead.

Order 2d. The metals the oxides of which are reduced to the metalic state by a red heat. They are mercury, silver, gold, platinum, palladium, rhodium, osmium, and iridium.

Potassium.

How is potassium procured? It may be procured by subjecting moistened hydrate of potassa to a galvanic battery, and the potassium will be found at the negative pole. A more abundant supply may be obtained by bringing fused hydrate of potassa in contact with turnings of iron heated to whiteness in a gun barrel. Another method is to mix iron filings and charcoal with potassa, in an iron bottle; in both cases the potassium is sublimed, and may be collected. The rationale is that the iron and charcoal abstract oxygen from the potassa, and the potassium is liberated.

What are the properties of potassium? It is solid at common temperatures, perfectly fluid at 150°, soft and malleable at 50°, and brittle at 32°; undergoes sublimation at a low red heat without change, provided there is no oxygen present, and is similar in lustre to mercury. Its prominent chemical property is its affinity for oxygen, which it combines with rapidly in the air, and by contact with ice or fluids containing oxygen, so that to preserve it it must be kept in tubes hermetically sealed, or under the surface of liquids which contain no oxygen, such as naphtha, oil copaiba, &c. Its equivalent is 39.15; specific gravity 0.86; symbol Po, or K.

What are the compounds of potassium and oxygen? They are the protoxide, which consists of 1 equivalent of potassium and 1 equivalent of oxygen; and the teroxide which is 1 equivalent of potassium, and 3 equivalents of oxygen.

What are the properties of the protoxide of potassium, potash, or potassa? Anhydrous potassa is a white solid, highly caustic, fuses at a temperature a little above redness, and is not decomposed or volatalized by a very high heat.

It has a great affinity for water, and forms three compounds with it with the disengagement of heat during the combination. It may be further distinguished by adding tartaric acid in excess to a salt of potassa dissolved in cold water, and a white precipitate, the bi-tartrate of potassa is formed. It may also be precipitated by perchloric acid, the perchlorate being nearly insoluble; and a solution of the chloride of platinum produces a yellow precipitate. There is also a light gelatinous precipitate by silicated hydrofluoric acid.

How is the teroxide of potassium formed? By burning potassium in the open air, or in oxygen gas an orange colored substance is formed, which is the teroxide of potassium.

How is the iodide of potassium procured? It may be formed by heating potassium in contact with iodine; the union of which takes place with the evolution of light and heat. But for procuring it in quantity the preferable mode is to add iodine to a hot solution of pure potassa, until the alkali is neutralized; by this process iodide of potassium and iodate of potassa are generated; evaporate this to dryness, and expose in a platinum crucible to a red heat, which will decompose the iodate, leaving the iodide of potassium.

What are the properties of the iodide of potassium? It is easily fusible, rises in vapor at a heat below redness, very soluble in water and alcohol, and deliquescent in a moist atmosphere.

Sodium.

How is sodium procured? By the same processes that we obtain potassium, substituting soda for the potassa.

What are the properties of sodium? It has a strong metalic lustre, in color similar to silver, is soft at common temperatures, fuses at 200°, and is vaporized at a red heat. It is oxidized by water like potassium. Its equivalent is 23.3; specific gravity 0.972; symbol So or Na.

What are the compounds of sodium and oxygen? They are the protoxide, which is 1 eq. of sodium, and 1 eq. of oxygen; and sesquioxide which is 2 equivalents of sodium and 3 of oxygen.

How is the protoxide of sodium, or soda obtained, and what are its properties? It may be obtained by the oxidation of sodium in air or water, from the ashes of sea weeds,

or common salt. Anhydrous it is a grey solid, difficult of fusion, and very similar to potassa in both its sensible and chemical properties, but may be distinguished from it by its forming with sulphuric acid a salt easily recognized as Glauber's salt, or sulphate of soda. Its salts are all soluble in water, cannot be precipitated, and on exposing them by means of a platinum wire to the blow pipe a rich yellow color is imparted to the flame.

How the sesquioxide of sodium obtained? By heating sodium to redness in oxygen gas. It is of an orange color, with neither acid or alkaline properties, and is decomposed by water into soda and oxygen.

How is the chloride of sodium procured? It may be formed by burning sodium in chlorine, by heating sodium in hydrochloric acid, and also by neutralizing soda with hydrochloric acid. It is found in nature under the name of rock salt, and in sea water, of which it forms a large part, also in many saline springs.

What are the properties of the chloride of sodium? It has an agreeably saline taste, fuses at a red heat, forms a transparent brittle mass on cooling, deliquesces in a moist atmosphere, but not in a dry one, and is decomposed by sulphuric acid, hydrochloric acid being set at liberty, and sulphate of soda formed. It possesses the property in a very high degree of preserving meat from putrefaction, and is used extensively in the arts.

Lithium.

How is lithium procured? By decomposing lithia by means of galvanism. It is a white colored metal, resembling sodium, and its eq. according to Berzelius is 6.44; symbol L.

What compound does lithium form with oxygen? It forms but one compound, which is 1 eq. of each, and is called lithia.

What are the properties of lithia? It closely resembles soda and potassa in its chemical relations. Its salts when heated on a platina wire before a blow pipe tinges the flame of a red color.

Barium.

How is barium procured? By decomposing the carbonate of baryta by means of galvanism, and forming an amalgam with mercury, which amalgam may be decomposed by

heat in a vessel free from air. The mercury being volatalized leaving the barium in its purity.

What are the properties of barium? It is a dark grey colored metal, attracts oxygen from the air, and yields a white powder, which is baryta, and decomposes water, hydrogen escaping, and baryta is formed. Its eq. is 68.7; symbol Ba.

What are the compounds of barium and oxygen? There are two; the protoxide which is 1 eq. of barium, and 1 eq. of oxygen; and the peroxide which is 1 eq. of barium and 2 eq. of oxygen.

How is the protoxide of barium, barytes or baryta prepared? It is produced by the oxidation of barium in air or water, and may be prepared by decomposing the nitrate of baryta at a red heat, or by subjecting the carbonate to an intense white heat with charcoal.

What are the properties of protoxide of barium? It is a grey powder, sp, gr. 4., difficult to fuse, has caustic alkaline properties, converts vegetable blues to green, and neutralizes acids, has a strong affinity for water, and an intense heat is produced by the union. It is distinguished by its alkaline solution, by all its soluble salts forming white precipitates, the carbonate of baryta, by the addition of alkaline carbonates; and the sulphate of baryta by the addition of a soluble sulphate or sulphuric acid; and by the characteristics of chloride of barium, formed by the action of the hydrochloric acid on baryta. The carbonate of baryta is soluble in dilute acid, and is poisonous in a soluble state, whether the solution is formed from acid in the stomach or out of it.

How is the peroxide of barium procured? By passing dry oxygen gas over pure baryta at a low red heat. This oxide is used in forming the peroxide of hydrogen.

Strontium.

How is strontium obtained? By a process analagous to that employed in procuring barium.

What are the properties of strontium? It is a heavy metal similar in properties to barium. Its equivalent is 43.8; symbol Sr.

What are the oxides of strontium? They are the protoxide, which is 1 eq. of strontium and 1 eq. of oxygen;

and the peroxide which is 1 eq. of strontium and 2 eq. of oxygen.

How is the protoxide of strontium or strontia prepared? From the nitrate and carbonate of strontia, in the same manner as baryta, which it resembles in most particulars. Its salts are not poisonous; when heated on a platinum wire before a blow pipe it communicates a red tint to the flame.

How is the peroxide procured? In the same way as peroxide of barium, and it is possessed of similar properties.

Calcium.

How is calcium procured? Its existence may be shown in the same manner as barium. It is of a whiter color than either barium, or strontium, and union with oxygen converts it into lime. Its equivalent is 20.5, symbol Ca.

How many compounds are there of calcium, and oxygen? Two; the protoxide, which is 1 eq., of calcium, and 1 eq. of of oxygen; and the peroxide, which is 1 eq. of calcium, and 2 eq. of oxygen.

How is the protoxide of calcium, lime, or quicklime, procured? By subjecting carbonate of lime to heat, sufficiently strong to expel its carbonic acid.

What are its properties? It is a brittle, white, earthy substance, somewhat alkaline, phosphorescent when heated to redness, fusible with great difficulty, has a strong affinity for water, which produces an increase of temperature by the union, and the result is slacked lime; it parts with its water at a red heat.

The most delicate test for its presence is oxalate of ammonia or potassa, the oxalate being insoluble. The nitrate yields prismatic crystals, is very deliquescent and soluble in alcohol, which properties distinguish it from baryta, and strontia, the nitrates of which crystalize in octohedrons, and are not deliquescent, or soluble in alcohol.

How is the peroxide of calcium procured? In the same way as the peroxide of barium, and possesses similar properties.

Magnesium.

How is magnesium procured? By the action of galvanism. It may also be obtained by the action of potassium on the chloride of magnesium.

What are its properties? It has a brilliant metalic lustre, a white color, is very malleable, and fuses at a red heat. It burns in oxygen gas when heated to redness, and magnesia is formed. Its equivalent is 12.7, symbol Mg.

What compound does magnesium form with oxygen? The protoxide, known as magnesia, which is 1 eq. of magnesium, and 1 eq of oxygen. It may be procured by exposing the carbonate of magnesia to a high red heat.

What are the properties of magnesia? It has feeble alkaline properties, except in forming neutral salts with acids. Its sulphate is very soluble, which serves to distinguish it from the other alkaline earths. It is precipitated from its salts as a hydrate by pure alkalies, and may be distinguished and separated from lime by the oxalate of ammonia.

Aluminum.

How is aluminum procured? By the decomposition of the chloride of aluminum by potassium.

What are the properties of aluminum? It is a grey powder, resembling platinum, or in small scales, or spangles of a metalic lustre; a conductor of electricity when fused, but not in powder, and fusible at a temperature above the fusing point of cast iron. Burns in the open air when heated to redness, and forms a white aluminous earth. Its equivalent is 13.7, Symbol Al.

What is the composition of alumina or aluminous earth? It is a sesquioxide of aluminum.

How is alumina procured? By dissolving purified alum, adding an excess of carbonate of potassa, the alumina is precipitated, and may be collected on a filter.

What are the properties of alumina? It is tasteless, inodorous, insoluble in water, very infusible, and has a powerful affinity for water.

It may be distinguished by being separated from the acids as a hydrate, by the alkaline carbonates, and ammonia; by being precipitated by pure soda, or potassa, and the precipitate redissolved by an excess of the alkali.

Manganese or Manganesium.

How is manganese procured? It is procured from the oxide, by heating it in contact with oil, and charcoal.

What are the properties of manganese? It is of a greyish white color, granular texture, difficult of fusion, tarnish-

es by exposure to the air, and burns if heated to redness in open vessels. Its eqivalent is 27.7; symbol Mn; specific gravity 8.

What are the compounds of manganese, and oxygen? The protoxide, 1 eq. of each; the sesquioxide. 2 eq. of manganese, and 3 eq. of oxygen; the red oxide, 3 eq. of manganese, and 4 eq. of oxygen; varvacite, which is 4 eq. of manganese, and 7 eq. of oxygen; manganic acid, 1 eq. of manganese, and 3 eq. of oxygen; and permanganic acid, which is 2 eq of manganese, and 7 eq. of oxygen.

How is the protoxide of manganese procured? By exposing the peroxide, sesquioxide, or red oxide of manganese to charcoal, and heat combined, or to heat, and a current of hydrogen.

What are the properties of the protoxide of manganese? It is of a light green color, attracts oxygen from the air, and unites readily with acids.

How is the sesquioxide of manganese procured? It is found in nature, and may be formed by exposing the peroxide for some time to a moderate red heat.

How is the peroxide or black oxide of manganese procured? It is found in nature mixed with silicious, or aluminous earths, oxide of iron, and carbonate of lime. It may also be formed artificially, by subjecting the nitrate of the protoxide of manganese to a low red heat, until the nitric acid is expelled.

What are its properties? It is unchangeable by exposure to the air, insoluble in water, does not unite with acids, or alkalies, and yields oxygen gas when boiled with sulphuric acid; or if hydrochloric acid is used, chlorine is evolved.

It is much used in the arts. for manufacturing glass, and in preparing chlorine for bleaching purposes.

How is the red oxide procured? It is found in nature, and may be artificially formed by exposing the peroxide, or sesquioxide to a white heat. Of the same degree of fineness it is brownish-red when cold, and black when warm.

How is the varvacite procured? It is only procured as a natural production among some of the ores of manganese.

Iron.

How is iron generally found in nature? In large quantities in combination with oxygen and sulphur, called ores of

iron; but it is diffused almost universally in greater or smaller quantities.

How is iron procured? By subjecting the ores roasted, and reduced to coarse powder, to the action of charcoal, or coke and lime at a high heat.

What is the rationale of this process? The carbon deprives the ore of its oxygen, and the lime acts as a flux by combining with the impurities and forms a compound fusible mass, called slag, which allows the melted particles of iron to descend through it, and collect at the bottom.

What are the properties of iron? It has a grey color, strong metalic lustre, susceptible of polish, is ductile, malleable, and very tenacious. It is attracted by the magnet, and may be rendered magnetic, a property possessed by no other metal except nickel. It has a strong affinity for oxygen, but does not take it from a dry atmosphere, but if moisture be present it oxidizes, or rusts; if heated to redness in the open air it absorbs oxygen rapidly, and is converted into black scales, which are the black oxide of iron; and if in oxygen it is attended with vivid scintillations. Its equivalent is 28, symbol Fe, sp. gr. 7.788.

What are the compounds of iron and oxygen? The protoxide, which is 1 eq. of each; the sesquioxide, which is 2 eq. of iron, and 3 eq. of oxygen; and the black oxide, 1 eq. of the protoxide, and 1 eq. of the sesquioxide combined.

Where is the protoxide of iron found, and what are its properties? It is the base of the native carbonate of iron. It is formed when metalic iron is placed in dilute sulphuric acid; and is precipitated as a white hydrate, from its salts by pure alkalies. Its salts when in solution absorb oxygen from the air. A solution of galls does not produce a change of color, but alkaline hydro-sulphates cause a black precipitate, the proto-sulphuret of iron.

How is the red or sesquioxide of iron procured? It is a natural product, known as red hæmatite, and is found massive, fibrous, and in rhomboidal crystals. It may be formed by dissolving iron in nitro-hydrochloric acid, and precipitating with an alkali. In this state it is a hydrate.

What are the properties of the red or sesquioxide? It combines with most of the acids, forming salts, which are generally red; and it may be precipitated from them by pure alkalies as a hydrate. Prussian blue is formed by the addition of ferrocyanuret of potassium to this oxide, and a

blood red color is produced by sulphocyanuret of potassium, and a black color by the infusion of galls. These last reagents may be considered as unerring tests for the minutest quantity of the sesquioxide, and any other oxide may be converted into this by nitric acid. It is not attracted by the magnet.

Where is the black or magnetic oxide of iron found, and what is its composition? It is found native, often crystalized in regular octohedron and dodecahedron form; it is attracted by the magnet, and may become magnetic. It is also formed when iron is heated to redness in the open air, or in contact with aqueous vapor. It is composed of the protoxide, and the red or sesquioxide combined.

What are the compounds of sulphur, and iron? The tetrasulphuret, disulphuret, proto-sulphuret, sesquisulphuret, bisulphuret, and magnetic pyrites, which is a compound of bisulphuret and protosulphuret.

What are the compounds of carbon and iron? There are three distinct compounds; graphite, cast or pig iron, and steel.

Where is graphite (called also plumbago and black lead) obtained? It is found as a natural production, and may be formed artificially by exposing iron with an excess of charcoal to a violent and long continued heat. It contains about 5 per cent of iron when pure.

Zinc.

How is zinc found in nature, and how is it procured? It is found native as a carbonate called calamine, and as a sulphuret, called zinc blende. It is procured by exposure to heat and carbon from the calamine, and from the blende by the same process after roasting or exposure to air at a low red heat. The metal is distilled by a process termed distillation by descent, and may be purified by being again distilled.

What are the properties of zinc? It has a metalic lustre, bluish white color, a laminated texture, is hard and brittle, and by exposure in close vessels to a white heat it is sublimed unchanged. It absorbs oxygen, and forms the white oxide or flowers of zinc, if heated to fusion in open vessels, or if heated to redness in a closed vessel, and the cover removed combustion takes place with a white light. Its equivalent is 32.3; sp. gr. 7; symbol Zn.

What are the compounds of zinc and oxygen? There are two, the protoxide which is 1 eq of each, and the peroxide the composition of which is uncertain.

How is the protoxide of zinc procured? By the addition of dilute sulphuric acid to zinc, and by collecting the flakes which arise during the combustion of zinc.

What are the properties of the protoxide of zinc? It is soluble in water, forms regular salts with acids, and combines with some of the alkalies. It is precipitated from its solutions as a white hydrate by pure potassa or ammonia; as a carbonate, by the carbonate of ammonia; and is redissolved by the addition of an excess of the precipitant. Alkaline carbonates precipitate it as a white carbonate, and hydrosulphate of ammonia precipitates it as a hydrated sulphuret.

Tin.

How is tin generally found in nature and how is it procured? It occurs native as an oxide; from which it may be procured by heat and charcoal.

What are the properties of tin? It resembles silver in its appearance; its brilliancy is lost slowly by contact with the atmosphere, it is malleable, inferior in ductility and tenacity, soft, inelastic, and when bent backwards and forwards produces a peculiar crackling noise. Its equivalent is 58.9; sp. gr. 7.291; symbol Sn.

What are the compounds of tin and oxygen? The protoxide 1 eq. of each; sesquioxide 2 eq. of tin and 3 eq. of oxygen, and the binoxide 1 eq., tin and 2 eq. of oxygen.

What is the purple of Cassius? It is a combination of the binoxide of tin and protoxide of gold, produced by the action of the protoxide of tin on a solution of gold. This property of forming a purple precipitate with a solution of gold is considered as a test for the protoxide of tin.

What is understood by stannates? They are combinations of binoxide of tin which possesses feeble acid properties, with the alkalies.

What is the composition of the fuming liquor of Libavius? It is the bichloride of tin, and the dense white fumes emitted when it is exposed to the air are caused by its union with moisture.

Cobalt.

How is cobalt found in nature? It is generally found in

combination with arsenic. Its equivalent is 29.5; sp. gr. 7.834; symbol Co.

What are the compounds of oxygen and cobalt? The protoxide, which is 1 eq. of each; the 4-3 oxide, 3 eq. of cobalt and 4 eq. of oxygen; the sesquioxide 2 eq. of cobalt and 3 eq. of oxygen.

Nickel.

How is nickel found in nature? Generally as a copper colored mineral, which is the arsenuret of nickel, containing small portions of sulphur, copper, cobalt and iron. The process for procuring it is somewhat complicated.

What are the properties of nickel? It is whitish, intermediate between tin and silver, has a strong metalic lustre, and is ductile and malleable. It is attracted by the magnet, and may be rendered magnetic, but its oxides are not. Its eq. is 29. 5; sp. gr. 8.279; symbol Ni.

Arsenic

How is arsenic found in nature? Sometimes native, but generally in combination with other metals.

How is it procured? By roasting the ores it is volatalized, combines with oxygen, and is condensed in cakes, which are the white oxide. From this the metal may be procured by heat and charcoal, the pure metal being sublimed, and may be collected in a proper vessel.

What are the properties of arsenic? It is brittle, has a metalic lustre, a whitish grey color, and crystalline. Its sp. gr. is 5.8843; eq. 37.7; symbol As.

What are the compound of arsenic and oxygen? There are two; the arsenious acid which is 2 eq. of arsenic and 3 eq. of oxygen; and the arsenic acid, 2 eq. of arsenic and 5 eq. of oxygen.

How is arsenious acid prepared? It is generated when arsenic is heated in open vessels, and it may be prepared by digesting it with dilute nitric acid, or the white arsenic of commerce (generated by roasting the ores of arsenic and cobalt,) may be purified by a second sublimation,

What are the properties of arsenious acid? It is mostly sold in the state of fine white powder, but when first sublimed it is in brittle masses of a vitreous lustre. It is sublimed at 380°, and may be condensed on cold surfaces. It is susceptible of two different crystalline forms, and is

therefore termed dimorphous. It reddens vegetable blue colors feebly, combines with salifiable bases, forming salts termed arsenites, and is a virulent poison.

What are the important tests for arsenious acid? The ammoniacal nitrate of silver, ammoniacal sulphate of copper, hydro-sulphuric acid, and hydrogen gas.

The first of these produces a yellow precipitate, the arsenite of oxide of silver. This test is liable to some objection when sea salt or animal and vegetable infusions are present, from the arsenites of siver not subsiding at all, or in such an impure state that it cannot be recognized properly.

The second, the ammoniacal sulphate of copper produces a green precipitate, known as Scheele's green; yet there are circumstances under which a greenish precipitate may be formed with ammoniacal sulphate of copper, that may be mistaken for Scheele's green where no arsenic is present, and under other circumstances it may be present in minute quantity, and no precipitate be formed. It may therefore, be considered a fallacious test when applied to mixed fluids, however sure it may be when the arsenious acid is dissolved in pure water.

The third, the hydrosulphuric acid produces a yellowish color in the liquid when this gas is passed through it, from the formation of orpiment, or the sesquisulphuret of arsenic. When this test is used the liquid should not contain a free alkali, and to avoid it a little acetic acid should be added.

Thus far this test may be considered fallacious, as the same colored precipitate may be produced with selenium, cadmium, tin, and antimony. But the precipitate, the sesquisulphuret of arsenic formed by this process, may be distinguished from all other substances by being dried, mixed with black flux, and heated in a glass tube to redness; decomposition takes place, and the metalic arsenic is deposited of an iron grey color externally, and crystalline internally, on the cool part of the tube. Additional evidence may be had by converting the metal into arsenious acid, which may be done by holding that part of the tube in which the metal is deposited, over a spirit lamp in such a manner that the metal may be sublimed slowly, and as it is vaporized it combines with oxygen, and is deposited in another portion of the tube in beautiful octohedral crystals, that may easily be detected by a practiced eye. In this experiment the tube should be clean and dry.

The fourth, the application of hydrogen. An arsenuretted hydrogen is formed, which is a gaseous compound that yields metalic arsenic or arsenious acid, and water in combustion; the metalic arsenic or arsenious acid being deposited, according as the supply of oxygen is more or less abundant, each with their peculiarities.

For the mode of conducting this process see Turner's, or some recent work on chemistry.

What are the compounds of sulphur and arsenic? There are three. The proto-sulphuret, or realgar is found in the mineral kingdom, and may be formed artificially by heating arsenious acid with about half its weight of sulphur until it fuses. Its eq. is 53.8.

The sesquisulphuret or orpiment is also found in nature, and may be prepared by fusing together equal parts of arsenious acid and sulphur. This is the coloring principle of the paint called King's yellow.

The persulphuret, which may be prepared by passing hydrosulphuric acid gas through a solution of arsenic acid. It resembles orpiment in color.

Antimony.

How is antimony found in nature? It is generally found as a sulphuret, and called crude antimony; although it sometimes occurs native.

How is it procured? By heating the sulphuret in a covered crucible with half its weight of iron filings, or by mixing with it two thirds its weight of cream of tartar, and one third nitre; and throwing the mixture in small portions successively into a red hot crucible.

What are the properties of antimony? It is brittle, white, running into bluish grey, has considerable metalic lustre, fuses at 810°, and is volatilized at a very high temperature. Its eq. is 64.6; sp. gr. 6.702; symb. Sb.

What are the compounds of antimony, and oxygen? The sesquioxide, which is 2 eq. of antimony, and 3 eq. of oxygen: the antimonious acid, 2 eq. of antimony, and 4 eq. of oxygen; and the antimonic acid, 2 eq. antimony, and 5 eq. oxygen.

How is the sesquioxide of antimony procured? By sublimation during the combustion of antimony; and by adding carbonate of potassa, or soda to a solution of tartar emetic.

What are the properties of the sesquioxide of antimony?

It is a white powder of a somewhat dirty appearance, when heated it acquires a yellow tint, and if protected from the atmosphere it may be sublimed without change. Heated in contact with the air, it absorbs oxygen, and if heated suddenly, it takes fire and burns; in both cases antimonious acid is generated. It is the only combination of oxygen and antimony which form salts with acids, and is the base of tartar emetic, or the tartrate of antimony and potassa. Its salts are insolublo in, or decomposed by water, except tartar emetic. The insoluble salts of antimony are rendered soluble by excess of tartaric, or hydrochloric acids. The presence of antimony in solution may easily be detected by hydrosulphuric acid, which produces an orange colored precipitate, hydrated sesquisulphuret of antimony, called Kerme's mineral.

What are the combinations of chlorine, and antimony? They are sesquichloride or butter of antimony, the bichloride, and the perchloride.

What are compounds of sulphur and antimony? They are the sesquisulphuret, the bisulphuret, and the persulphuret.

Copper.

How is copper found in nature? It is often found native, but generally in combination with sulphur, as the native sulphuret, which is sometimes combined with sulphuret of iron.

What are the properties of copper? It is of a red color, which distinguishes it from all other metals, except titanium, ductile, malleable, tenacious, hard, elastic, and sonorous. It does not change in a dry atmosphere, but rusts in a damp one, and is converted into a green carbonate of the black oxide of copper. Its equivalent is 31.6; sp. gr. 8. 895. symbol Cu.

What are the compounds of copper and oxygen? They are the red or dioxide, which is 2 eq. of copper, and 1 eq. of oxygen; the black or protoxide, 1 eq. of copper, and 1 eq. of oxygen; the superoxide, 1 eq. of copper, and 2 eq. of oxygen.

Which of these oxides unites with acids and form salts? The protoxide.

What is blue vitriol? It is the sulphate of copper, formed by boiling sulphuric acid upon copper.

How are the salts of copper distinguished? They have a green or blue tint, hydrosulphuric acid precipitates a dark brown sulphuret; and ferrocyanuret of potassium precipitates a reddish brown ferrrocyanuret; and it is precipitated in the metalic state by a rod of iron, or zinc.

What is crude verdigris? It is a mixture of neutral acetate or sub-acetate of copper with impurities.

What are the crystals of Venus? It is a crystalized neutral acetate.

Lead.

How is lead found in nature? As a sulphuret, the galena of mineralogists; as an oxide; and as a salt.

How is it procured? From the galena, by heating it in a reverberatory furnace, which oxidizes a portion of the lead, and drives off the sulphur, yielding the protoxide of lead, and the pure metal; and it may be obtained from any of its oxides by heat, and charcoal.

What are the properties of lead? It has a bluish grey color, a strong metalic lustre, tarnishes by exposure to the air, and acquires a thin coat of the carbonate of the protoxide. It fuses at 612°, and is ductile in large masses. Its equivalent is 103.6; sp. gr. 11.352; symbol Pb.

What are the compounds of lead, and oxygen? They are the dinoxide, which is 2 eq. of lead, and 1 eq. of oxygen; the protoxide or massicot, 1 eq. of lead, and 1 eq. of oxygen; the peroxide, 1 eq. of lead, and 2 eq. of oxygen; and the red oxide or minium, 3 eq. of lead, and 4 eq of oxygen.

What are the characteristics of the dinoxide? It is generally known as dross; it is of a dark grey color, and is unimportant in its chemical relations.

How is the protoxide procured? By collecting the grey film which forms on the surface of melted lead, and exposing it to heat and air until it becomes yellow.

In the state of powder it is called massicot; but when partially fused, by which it is vitrified, it is called litharge, and contains a slight mixture of red oxide.

What are its properties? It has a lemon yellow color, it is insoluble in water, fused at a bright red heat, and unchangeable in the fire, but may be reduced by heat, and combustible matters. It is the base of all the salts of lead, and they are generally of a white color. It acts in some cases as an acid by uniting with alkalies.

Which salt of lead is the most poisonous? The carbonate or white lead, so that any salt of lead, as the acetate, which is easily changed into the carbonate may also be poisonous by conversion into the carbonate in the stomach. This may be obviated by administering an excess of vinegar, or acetic acid with the acetate.

What are the tests for lead? The hydrosulphuric acid. It is also separated from its salts in the metalic form by iron, or zinc. The lead is deposited forming the arbor Saturni.

How is peroxide of lead procured? By the action of nitric acid on minium, which dissolves the protoxide and leaves the peroxide; and by passing a current of chlorine through a solution of acetate of lead. This oxide is of a pure brown color, insoluble in water, does not unite with acids, and is resolved into a salt of the protoxide, and oxygen gas by strong ox-acids.

How is the red oxide or minium procured? By heating the protoxide nearly to redness, and suffering it to cool slowly.

What are the properties of the red oxide? It does not unite with acids, gives off oxygen when heated to redness, and is converted into the protoxide; it is resolved into protoxide and peroxide by nitric acid.

What other compounds are formed with lead? The chloride, iodide, bromide, fluoride, sulphuret, phosphuret and carburet of lead.

Mercury or Quicksilver,

How is mercury found in nature? It is found native, combined with sulphur as cinnibar, which is its most abundant form; amalgamated with silver; and as a chloride.

How is it procured, and from where? By heating the sulphuret with lime, or iron filings, by which means the mercury is volatalized, and the sulphur retained. To purify it it may be digested with sulphuric acid. It is brought principally from Spain, Hungary, Asia, and South America.

What are its properties? It is fluid at common temperatures, of a tin white color, and has a strong metalic lustre. It freezes at 39 or 40° below zero; boils at about 662°, and does not tarnish by exposure to the air if perfectly pure. It is acted upon by nitric and hot sulphuric acids. Its eq. is 202; sp. gr. fluid 13.568; frozen 15.612; symbol Hg.

What are the compounds of mercury and oxygen? There

are two, the protoxide, which is 1 eq. of mercury and 1 eq. of oxygen; and the peroxide, which is 1 eq. of mercury, and 2 eq. of oxygen.

How is the protoxide of mercury procured? By mixing calomel, or protochloride briskly, with an excess of potassa, the oxygen and chlorine exchange places, and chloride of potassium, and the protoxide of mercury are formed. It may also be procured by adding an alkaline solution to the nitrate of the protoxide of mercury.

What are the properties of the protoxide of mercury? It is a black powder, easily decomposed, unites with acids, but is a weak base. The nitrate is decomposed by alkalies, which throw down the protoxide; by alkaline carbonates throwing down the white carbonate; by hydrochloric acid, or any soluble chloride, and the potochloride, or calomel is formed; and by hydrosulphuric acid, and the black protosulphuret is produced.

How is the peroxide procured? By the action of heat and air combined; by dissolving mercury in nitric acid; and by exposing the nitrate to a heat sufficient to expel the nitric acid. It is the red precipitate of popular language.

What are the properties of the peroxide? It is in shining crystalline scales, when hot it is nearly black, and red when cold; finely powdered it is of an orange color; when heated to redness it is resolved into metalic mercury and oxygen. It is separated from acids by ammonia and its carbonate, as a white precipitate.

What are the compounds of chlorine and mercury? They are the protochloride or calomel, which is 1 eq. of mercury and 1 eq. of chlorine; and the bichloride or corrosive sublimate, which is 1 eq. of mercury, and 2 eq. of chlorine.

How is the protochloride or calomel procured? It is generated when mercury and chlorine come in contact at common temperatures, by the union of mercury and the bichloride, which should be sublimed, and by mixing the nitrate of the protoxide with hydrochloric acid, or a soluble chloride.

What are its properties? It is white, crystalline, compact, tasteless, inodorous, and not altered by exposure to the atmosphere if light is excluded; but by this it is rendered black and partially reduced to the metalic state; alkaline solutions render it black by the formation of the protoxide.

How is the bichloride procured? By heating mercury in chlorine gas, and by subliming a mixture of 293.2 parts of the bisulphate of the peroxide of mercury with 117.44 parts of the chloride of sodium. The products of this last process are 1 eq. of the bichloride of mercury, and 2 eq. of the sulphate of soda.

What are its properties? It is white, semi-transparent, crystalline and poisonous; has an acid, burning taste, and leaves a nauseous, metalic one. It is slightly soluble in cold water, and highly soluble in hot water and alcohol. By the addition of ammonia to its solution, the white precipitate is formed.

What are the tests for corrosive sublimate? Hydrosulphuric acid precipitates the black sulphuret of mercury; lime water and the pure fixed alkalies a yellow peroxide of mercury; hydriodate of potassa precipitates the deutoiodide of mercury, which is of a pale scarlet color and resembles no other iodide; another is to place a drop of the suspected liquid on polished gold, and touch it through the liquid with a piece of iron wire or point of a knife, when the part touched instantly becomes white, which is caused by an amalgam of gold. Albumen or white of eggs produces a white flocufent precipitate, which is a compound of calomel and albumen, and is inert; therefore white of eggs is an antidote for poisoning by corrosive sublimate.

What are the iodides of mercury? They are the protoiodide, which is mercury 1 eq., and iodine 1 eq.; and is obtained by mixing the nitrate of the protoxide of mercury with the iodide of potassium. It is a greenish powder insoluble in water.

The sesqui-iodide, which is 2 eq. of mercury to 3 eq. of iodine, and is obtained by adding the iodide of potassium in solution to a mixture of the nitrates of the protoxide and the peroxides of mercury.

The biniodide which is 1 eq. of mercury, and 2 eq. of iodine; and is obtained by adding the iodide of potassium in solution to the nitrate of the peroxide, or to the bichloride of mercury. It is precipitated as a rich red colored powder vieing in beauty with the vermillion.

What are the compounds of mercury and sulphur? The protosulphuret, which is 1 eq. of mercury to 1 eq. of sulphur; and may be formed by passing hydrosulphuric acid gas through a solution of the nitrate of the protoxide of mercury, or through water with calomel suspended in it.

The bisulphuret, which is 1 eq. of mercury, to 2 eq. of sulphur; and is formed by fusing sulphur with six times its weight of mercury, and subliming in close vessels. This is fictitious cinnibar, and when powdered it forms the beautiful pigment vermillion.

What is ethiops mineral? It is a mixture of sulphur, and the bisulphuret of mercury, and is formed by triturating together equal parts of mercury and sulphur.

What compound does mercury form with cyanogen? A bicyanide, obtained by boiling the red oxide of mercury with Prussian blue.

Silver.

How is silver found in nature, and where? It is found native, and in combination with sulphur in galena, also combined with gold, antimony, copper, &c. Nearly all the lead of commerce contains traces of silver. It is found in Mexico, Peru, and Hungary.

How is it procured? By amalgamation, and cupellation, depending upon the form of ore used. It may be obtained pure from coin by dissolving it in nitric acid, and decomposing the nitrate.

What are its properties? It is the clearest white of the metals, receives a beautiful polish, is very malleable, ductile, quite tenacious, soft when pure, and when fused in open vessels it absorbs oxygen. It is blackened by sulphur and chlorine. Its equlvalent 108; specific gravity 10.51; symbol Ag.

What are the compounds of silver and oxygen? They are the protoxide, which is 1 eq. of silver, and 1 eq. of oxygen; and is obtained by decomposing the nitrate by potash or soda. It is of a deep olive color, soluble slightly in water, and forms a fulminating compound with ammonia. It is precipitated in the metalic state by most of the metals; when mercury is employed it assumes an arboresent appearance called arbor Dianae. And the peroxide, which is unimportant in its chemical relations.

How is the nitrate of silver procured? By the action of nitric acid on silver; when it has been fused it is called lunar caustic.

What is the best test for silver? Chlorine, and the muriates, which form an insoluble chloride.

How is the chloride of silver prepared? It sometimes

occurs native, and is called horn silver; it is generated when silver is heated in chlorine gas, and may be precipitated by adding hydrochloric acid, or a soluble chloride to the nitrate of silver.

What are its properties? It is white, insoluble in water, slightly soluble in acids, but very soluble in ammonia, and is decomposed by hydrogen.

How is the iodide of silver procured? By adding the iodide of potassium to a solution of the nitrate of silver. It is greenish yellow, and is soluble in water and ammonia.

How is the sulphuret of silver procured? Silver unites with sulphur on exposure to hydrosulphuric acid, and by transmitting this gas through a solution of the nitrate, when it subsides as a dark brown precipitate, the sulphuret of silver.

Gold.

How is gold found in nature, and where? It is found pure and in combination with other metals in North and South America, Hungary, and Liberia.

How is gold obtained pure? By amalgamation with mercury, and then distilling off the mercury; by making a solution in nitro-hydrochloric acid, and precipitating it by the sulphate of iron.

What are the properties of gold? It has a yellow color which distinguishes it from all other simple metals, is very malleable and ductile, but inferior to several in brilliancy and tenacity. It has but little affinity for oxygen or sulphur. Its equivalent is 199.2; sp. gr. 19.257; symbol Au. Its solvent is chlorine to which the nitro-hydrochloric acid owes its solvent powers.

What are the oxides of gold? The protoxide, 1 eq. of each; the binoxide, 1 eq. of gold to 2 eq. of oxygen; and the teroxide, 1 eq. of gold, to 3 eq. of oxygen.

What is the test for gold in solution. The protochloride of tin, which throws down the purple of Cassius.

Platinum.

How is platinum found in nature, and where? In the metalic state, associated or combined with other metals. It is found in South America, and in the Uralian mountains.

How is it obtained? By dissolving the native grains of platinum in aqua regia, or nitro-hydrochloric acid, and ad-

ding to it a solution of sal ammoniac, which affords an orange yellow precipitate. This is to be washed, dried and exposed to a red heat, which isolates the metal in a porous state, called platina sponge; which may be consolidated by mechanical pressure, heat, and hammering.

What are the properties of platinum? It has a white color, with a lustre inferior to silver, is malleable, ductile, may be welded at high temperatures, and is difficult of oxidation, or fusion. Chlorine, or solutions which afford it is its proper solvent. It is the heaviest of known metals, sp. gr. 21.5, eq. 98.8, symb. Pl.

What are the compounds of platinum? There are three oxides, two chlorides, two iodides, and two sulphurets.

What is the test for platinum? Proto-chloride of tin, which throws down a claret colored precipitate.

Alloys and Amalgams.

What is meant by alloys, and amalgams? Alloys are combinations of the metals with each other, and when mercury is a constituent they are called amalgams.

Under what circumstances do metals combine with each other? It is necessary that at least one of them should be liquid, when they will unite if the attraction is energetic.

Do they combine in definite proportions only? They unite in all proportions; yet there appears to be a tendency to unite in definite proportions, as some compounds of this kind occur native.

What are the general properties of alloys? They resemble the metals, are opaque, possess metalic lustre, and are good conductors of heat, and electricity. The color is sometimes changed from that of its constituents; the hardness is generally increased, consequently the sonorousness is in general increased, the malleability, and ductility are usually impaired; the density is sometimes greater, sometimes less; the fusibility is greatly increased, and the tendency to unite with oxygen augmented.

Salts.

How is the class of salts divided? Into four orders:

Order 1st. The oxy-salts; or those salts the acids or bases bases of which are oxidized bodies.

Order 2d. The hydro-salts; or those salts the acids or bases of which contain hydrogen.

Order. 3d. The sulphur-salts; or those salts the electro-positive or negative ingredients of which are sulphurets.

Order 4th. The haloid salts; or those salts the electro-positive, or negative ingredients of which are haloidal.

What is meant by deliquescent salt? It is where a salt attracts moisture, and becomes liquid.

What by an efflorescent salt? It is where a salt loses its water of crystalization,and falls down into a white powder.

What is the water of crystalization? It is water which unites with a salt in crystalization, and forms a part of the crystal, but is not an essential ingredient to the existence of the salt.

What are the characteristics of the sulphates? In solution a white precipitate (the sulphate of baryta), is thrown down by the chloride of barium, which is a test for sulphuric acid, free, or combined.

They are soluble with the exception of the sulphates of baryta, of the oxides of tin, antimony, bismuth, lead, and mercury. Those sparingly soluble, are the sulphates of strontia, lime, zirconia, yttria, and of the oxides of cerium, and silver. The other sulphates are quite soluble in water.

What are the characteristics of the sulphites? The sulphuric, hydrochloric, phosphoric, and arsenic acids decompose the sulphites with effervescence, owing to the liberation of sulphurous acid gas; they are converted by nitric acid into sulphates.

What is the prominent characteristic of the nitrates? They are decomposed invariably at a high temperature.

What is the prominent characteristic of the nitrites? By the addition of a strong acid the red fumes of nitrous acid are disengaged.

What is the characteristic of the chlorates? They are decomposed at a red heat, oxygen gas is evolved, and a chloride is formed.

What characterizes the chlorites? They are soluble in water, and possess high bleaching, and oxidizing properties.

What characterizes the iodates? They are similar to the chlorates, iodides being formed of course, instead of chlorides when heated.

What characterises the arseniates? When heated to redness with charcoal they are decomposed, and metalic arsenic is set at liberty.

What characterizes the chromates? They are generally either of a red or yellow color, are decomposed by heat, and the acid is resolved into green oxide of chromium, and oxygen gas.

What characterizes the carbonates? Their decomposition with effervescence by nearly all the acids, and most of them are decomposed by heat.

How may the salts of ammonia be distinguished? By the addition of pure potassa, when the odor of ammonia is given off.

How may the hydrosulphates be distinguished? By hydrosulphuric acid being expelled with effervescence by other acids.

ORGANIC CHEMISTRY.

What is understood by organic chemistry? It comprehends the history of those compounds which are of animal, or vegetable origin.

What are the simple elements coming under notice in organic chemistry? They are carbon, hydrogen, oxygen, and nitrogen, with traces of phosphorus, sulphur, iron, silicic acid, potassa, lime, &c.

Are organic substances liable to decomposition? Yes; they are very prone to decomposition, the tendency of carbon, and hydrogen being to appropriate to themselves as much oxygen as will form carbonic acid and water; and when the oxygen is insufficient, carbonic oxide, and carburetted hydrogen are formed. When the organic substance contains nitrogen it is very prone to decomposition, and water, carbonic acid, hydrocyanic acid, and ammonia are formed. They are all decomposed at a red heat, and nearly all below this temperature.

What are the particular characteristics of organic products? They are composed of the same elements, undergo spontaneous decomposition with facility, cannot be formed by the direct union of their elements, and are decomposed at a red heat.

Vegetable Chemistry.

What are the simple elements of vegetable substances? Oxygen, hydrogen, carbon, and a few contain nitrogen.

What is meant by the proximate, or immediate principle of vegetables? They are compounds which exist ready formed in plants, such as sugar, starch, and gum.

What is meant by the proximate analysis of vegetables? It is the process of separating the proximate principles from

each other, and the reduction of the proximate principles into their simplest parts constitutes their ultimate analysis.

How may vegetable substances be arranged? Into the vegetable acids, the vegetable alkalies; neutral substances, the oxygen and hydrogen of which are in the ratio to form water; the oleaginous, resinous, and bituminous principles; the spirituous, and ethereal principles; coloring matter; and compounds which cannot be classed under the preceding heads.

Vegetable Acids.

What are the vegetable acids? They are compounds possessing acid properties, which are the products of vegetation.

What are the general properties of vegetable acids? They are decomposed at a red heat, less liable to spontaneous decomposition than other vegetable substances, decomposed by hot nitric acid, by which they are converted into carbonic acid and water.

Is oxygen always in a proportion above that for forming water, in vegetable acids? Generally, but not always; sometimes it is even in a less proportion as in benzoic acid; but when there is more oxygen than suffices to form water with hydrogen, the vegetable substances are always acid.

Where is Oxalic acid found? In several plants ready formed as in the rumex acetosa or common sorrel; the oxalis acetosella or wood sorrel; and it may be prepared by digesting sugar with nitric acid.

What are the properties of oxalic acid? It crystalizes in slender flattened four and six sided prisms, terminated by six sided summits, but the primary form is an oblique rhombic prism; it has a sour taste, reddens litmus, and forms neutral salts with alkalies, and is very soluble in water.

It is powerfully poisonous, and is frequently taken by mistake for epsom salts, which it resembles. Chalk is its antidote with which it forms an insoluble oxalate of lime.

It is distinguished from all other acids by the form of its crystals, and by its solution giving with lime water a white insoluble precipitate.

Where is Acetic acid found? It exists in the sap of many plants, either free or combined; it is generated by the destructive distillation of vegetable matter, and is produced by the acetous fermentation. It is best obtained pure and

concentrated by decomposing the acetates by sulphuric acid. For chemical purposes it is obtained by the destructive distillation of wood, and sold under the name of pyroligneous acid.

How is acetic acid distinguished? By its flavor, odor, and volatility. Its salts are called acetates, and are all soluble in hot and most of them in cold water.

Where is Lactic acid found? In sour milk, and in the beet root.

Where is Kinic acid found? In cinchona bark in combination with lime, quinia, and cinchona.

Where is Malic acid found? In the acidulous fruits, such as grapes, oranges, currants, apples, &c.

Where is Citric acid found? In the juice of the lime, and lemon.

From what is Tartaric acid procured? It exists in the juice of some of the acidulous fruits, but generally in combination with lime or potassa.

It is prepared by mixing chalk with cremor tartar from which the tartrate of lime is thrown down, and the tartrate of potassa remains in solution; to the tartrate of lime sulphuric acid is added, and the tartaric acid is set at liberty.

What are the properties of tartaric acid? It has an agreeable sour taste, reddens litmus, and forms with alkalies neutral salts called tartrates It is distinguished by forming a white precipitate, the bitartrate of potassa when mixed with any of the salts of potassa; it therefore separates potassa from the other acids, and produces a precipitate with lime, which is soluble in an excess of the acid. It is remarkable in forming double salts, the most important of which, are those of potassa and soda, or the Rochelle salt, and of oxide of antimony and potassa, or tartar emetic.

What is the cream of tartar of the shops? It is the bitartrate of potassa; in an impure state known by the name of tartar,it is found encrusted on the sides and bottom of wine casks; being insoluble in alcohol, it is deposited as alcohol is formed during the vinous fermentation.

Where is Benzoic acid found? In gum benzoin, storax, balsam of Peru, Tolu, &c.; also in the urine of the cow, and of children. It is generally procured from gum benzoin.

Where is Meconic acid found? It is found only in opium combined with morphia. It is known by forming with the sesqui-salts of iron a purple-red color, which renders it valuable as a test for opium.

Where is Tannic acid or Tannin found? In the excrescences of the oak called gall nuts, in the bark of most trees, in kino, catechu, the tea plant, sumach, uva ursi, and in astringent plants generally; it is the principal cause of astringency in vegetables.

What are the properties of tannic acid?

It is colorless, inodorous, has an astringent taste, no bitterness, and may be kept in the solid state. It is soluble, reddens litmus, and decomposes the carbonates. It strikes a deep blue precipitate with the sesqui-salts of iron, but not with the proto-salts, which distinguishes it from all other substances except gallic acid, and from this it may be distinguished by yielding with a solution of gelatin, a white flaky precipitate soluble in a solution of gelatin, but insoluble in water and gallic acid. This compound of tannic acid and gelatin called tanno-gelatin, is the basis of leather.

Where is Gallic acid found? In most substances which contain tannic acid, and is probably developed by the oxidation of that acid. It does not precipitate gelatin or the salts of the vegetable alkalies.

How is the succinic acid obtained? By heating powdered amber in a retort.

Vegetable Alkalies.

What is understood by vegetable alkalies? They are those proximate vegetable principles which possess alkaline properties. They all contain nitrogen, are decomposed by a moderate heat, and are but slightly soluble in water.

What is their composition? Carbon, hydrogen (in greater proportion than to form water,) nitrogen, and oxygen; and they always exist in combination with an acid.

How are they generally procured? The substance containing the alkaline principle is digested or macerated in a large quantity of water to dissolve the salt, of which the alkali is the base. Then add a powerful salifiable base which unites with the acid, the alkaline base is set at liberty, may be collected on a filter, purified by solution in boiling alcohol, and evaporated to dryness.

What are some of the most prominent vegetable alkalies? Morphia, narcotina, codeia, narceia, cinchonia, quinia, aricina, strychnia, brucia, veratria, emetia, and delphia.

Where is Morphia found in nature? It is the medicinal agent of opium, in which it is combined with meconic and sulphuric acids, and other foreign matters.

What are the properties of morphia? Colorless crystals of a brilliant lustre, and in irregular six sided prisms, may be obtained from the alcoholic solution. It is insoluble in cold, and slightly in hot water, tasteless when pure, but very bitter when dissolved in alcohol, or rendered soluble by means of an acid. Strong nitric acid converts it into oxalic acid, and with a sesquisalt of iron it strikes a blue tint. It is almost inert when pure from its insolubility, but when in solution it acts with great energy. By decomposing a salt of morphia when taken into the stomach, by ammonia, the effects of an over dose may be prevented. It decomposes iodic acid, and sets iodine, free which may be recognized by starch its appropriate test; one grain of pure morphia in 7000 grains of water may be recognized by this test.

Where are Cinchonia, and Quinia found? In the cinchona bark, in union with kinic acid.

How are they procured? By taking up the soluble parts of the bark by hot water acidulated with hydrochloric acid; concentrate the solution, and digest with successively added portions of slaked lime until the liquid becomes alkaline. The precipitate is carefully collected, and the vegetable alkali separated by boiling alcohol.

What are the properties of cinchonia? When pure it crystallizes in colorless quadrilateral prisms, insoluble in cold, slightly soluble in hot water, and very soluble in boiling alcohol. It has a very bitter taste when dissolved by alcohol, or an acid; and forms salts with acids.

What are the properties of quinia or quinine? It is precipitated from its solutions by alkalies in white flocks, which do not crystallize; very soluble in alcohol, and ether, but very slightly so in water. Its medicinal virtues are more powerful than those of cinchonia. It forms salts with acids, the most important of which is the disulphate and is prepared in large quantities for medical purposes, crystallizing in delicate white needle shaped crystals.

The sulphate of quina is frequently adulterated; and the substances generally employed are water, sugar, starch, gum, ammoniacal and earthy salts. When pure it should only loose 8 or 10 per cent of water of crystallization by heat. The other impurities may be detected by the appropriate means.

Where is Strychina found? In the fruit of the strychnos

ignatia, and the strychnos nux vomica, and has also been extracted from the Upas.

What are the properties of strychnia? It is soluble in boiling alcohol, and by evaporation it is procured in four sided prisms. It is a virulent poison, producing death in a very short time if taken in sufficient quantity. Its action is accompanied by tetanic symptoms.

Neutral Substances, the Oxygen and Hydrogen of which are in the same ratio as in Water.

What substances are included in this class? Sugar, Mannite, Wheat Starch, Potato Starch, Gum Arabic, and Lignin.

Oleaginous, Resinous, and Bituminous Substances.

What is remarkable in this class of bodies? Their combustibility, besides other properties common to each. They generally contain hydrogen in a larger proportion than is necessary to form water with their oxygen, and they exert a feeble affinity for other bodies.

What are the characteristics of oils? They are inflammable, have a peculiar unctious feel, and are insoluble in water. They are divided into fixed and volatile; the former gives a permanent greasy stain to paper; and the latter produces one which disappears by a gentle heat.

Where are fixed oils usually found? In the seeds of plants, but olive oil is procured from the pulp which surrounds the stone. These oils are obtained by burning the seeds, and subjecting the pulpy matter to pressure and a gentle heat.

They absorb oxygen, and become rancid when exposed to the atmosphere, or to oxygen gas; they also unite with alkalies and form soap.

What are their component parts? Margarine or the hard portion; and elaine or oleine.

Where are volatile or essential oils found? In aromatic plants, from which it is obtained by distillation.

What oil is procured from bitter almonds? When bruised and subjected to compression it yields a pure fixed oil; but when distilled with water a poisonous volatile oil passes over which contains hydrocyanic acid.

Resinous Substances.

What are resins? The inspissated juices of plants

either pure or in combination with essential oils. They are solid, brittle, inodorous, insipid, and generally of a yellow color; semi-transparent, non-conductors of electricity, and negatively electric when rubbed.

The most important of the resins are common resin, copal, lac, sandrach, mastich, elemi, and dragons blood.

What are balsams? They are compounds of resin and benzoic acid.

What are gum-resins? They are the concrete juice of plants which contain resin, essential oil, gum, and extractive matter. Their proper solvent is proof spirit. Under this head are aloes, ammoniacum, assafœtida, euphorbium, galbanum, gamboge, myrrh, scammony, and guiacum.

Bituminous Substances.

How are bituminous substances divided? Into bitumen and pit coal; under the first head are naphtha, petroleum, mineral tar, asphaltum, mineral pitch, and retina-sphaltum; and under the latter head are brown coal, common or black coal, and glance coal or anthracite.

Spirituous and ethereal Substances.

Alcohol.

Is alcohol the intoxicating ingredient in all spirituous and vinous liquors? It is; and is always a product of the vinous fermentation; therefore does not exist ready formed in plants.

How is the alcohol procured pure? By the addition of heated carbonate of potash, (or any other substance having a strong affinity for water,) to spirit of wine; the potash unites with the water subsides, and the alcohol may be decanted pure.

Ether.

How is ether procured? By heating the stronger acids with alcohol; the different kinds are distinguished by the name of the acids used in their preparation.

Coloring Matters.

What are the prevailing colors of vegetables? Red, yellow, blue, and green, or their mixtures.

Does vegetable coloring matter occur in an insulated state? No; it is always attached to some proximate prin-

ciple, such as mucilaginous, extractive, or resinous substances, by which its properties are influenced.

It is generally decomposed by the combined agency of the sun's rays, and a moist atmosphere; and all of them are destroyed by chlorine.

What is meant by lakes? They are insoluble compounds formed by coloring matter with some of the metalic oxides.

What is meant by the term mordant or basis? It is a substance having an affinity both for the coloring matter, and the article to be colored; which by combining with each at the same time causes the dye to be permanent.

Those coloring substances which adhere to the cloth without a basis, are called substantive colors, and those which require a basis, adjective colors.

What substances produce the blue dyes? Indigo.

What the red? Cochineal, lac, archil, madder, brazil wood, logwood, and safflower.

The yellow? Quercitron bark, turmeric, wild American hickory, fustic, and saffron; all of which are adjective colors.

The black? The same ingredients as writing ink, and is therefore essentially oxide of iron with gallic acid and tannin.

Substances which do not belong to either of the preceding sections.

What are the articles belonging to this class? Vegetable albumen, gluten, yeast, asparagin, bassorin, caffein, cathartin, fungin, suberin, ulmin, lupulin, inulin, medullin, piperin, olivile, sarcocoll, rheubarbarin, rhaponticin, colocyntin, berberin, bryonin, gentianin, zanthopicrin, scillitin, senegin, saponin, arthanatin, plumbagin, chlorophyle, amygdalin, salicin, populin, meconin, columbin, elatin, sinapisin, &c.

Spontaneous changes of Vegetable matter.

What is Fermentation? It is certain spontaneous changes which vegetable substances undergo when the vital principle is extinct. It is divided into four distinct kinds, viz: the saccharine, vinous, acetous and putrefactive.

What substances undergo the saccharine fermentation? Starch is the only one known to be subject to this fermentation, which takes place when it is kept in a moist state for some time; and sugar equal to half the weight of the starch employed is formed.

What circumstances are necessary to the vinous fermentation? The presence of sugar, water, yeast, or some ferment, and a certain temperature. The changes which take place are the disappearance of sugar, the formation of alcohol, and the escape of carbonic acid gas.

Under what circumstances does the acetous fermentation take place? When a liquid which has undergone the vinous fermentation is mixed with yeast, and exposed to the open air. In this process oxygen is absorbed, and carbonic acid gas is disengaged.

What circumstances are necessary to the putrefactive fermentation? The accompanying circumstances which enable this process to take place, are moisture, air, and a certain temperature; the most favorable temperature is between 60 and 100 degrees.

The principal products are water, light carburetted hydrogen, carbonic acid, and when nitrogen is present, ammonia. The solid remains are charcoal combined with oxygen, and hydrogen.

Germination.

What conditions are necessary to germination? Moisture, a certain temperature, and oxygen gas. Light, which is favorable to the subsequent stages of vegetation, is injurious to germination.

Animal Chemistry.

What is meant by proximate animal principles? They are distinct compounds derived from the bodies of animals.

How are they distinguished from vegetable matter? By the presence of nitrogen, their strong tendency to putrefy; and the offensive products of putrefaction. Some vegetable principles contain nitrogen, but they not putrefy readily.

What are the essential constituents of animal compounds? Carbon oxygen, hydrogen, and nitrogen; besides, some of them contain phosphorus, sulphur, iron, earthy and saline matters.

What effect has heat upon them when applied in a close vessel? They yield water, carbonic oxide, carburetted hydrogen, carbonate and hydrocyanate of ammonia, a fœtid, thick oil, and carbonaceous matter, which is a powerful decolorizing agent.

What is the principle of the mode of analyzing animal

and vegetable substances. It is to convert the whole of the carbon contained, into carbonic acid, and the hydrogen into water.

How are animal products divided? 1st. Into those which are neither acid nor oleaginous; 2d. the acids; and 3d. the oils, and fats.

What substances are included in the first division? Fibrine, albumen, gelatin, urea, sugar of milk, and sugar of diabetes.

In what does Fibrin exist? In muscle, chyle, and blood. It is solid, white, insipid, and inodorous.

Where is Albumen found? In the white of eggs, and in the serum of the blood.

What are the properties of albumen? It is precipitated by corrosive sublimate, which is its best test; and it is coagulated by heat, alcohol, and the stronger acids.

Where is Gelatin found? In the skin, cartilages, membranes, and bones.

What are its properties? It is readily soluble in water, and forms a jelly when cool; it is known in commerce by the name of glue; tannic acid is its appropriate test.

Where is Urea found? It is procured from fresh urine.

What are the proximate principles of animal oils? Stearine, margarine, and oleine.

What circumstances are necessary to the putrefaction of animal substances? Water, air, and a certain temperature.

What are the products of putrefaction? Water, ammonia, carbonic and acetic acids, carburetted and sulphuretted hydrogen, and phosphuretted hydrogen in some cases.

ANALYTICAL CHEMISTRY.

By what process do you analyze a gaseous mixture containing oxygen? Introduce into the mixture a quantity of hydrogen, more than sufficient to saturate the oxygen present, carefully measure the whole, pass an electric spark through it, or introduce into it a piece of spongy platinum, and note the diminution; divide the diminution by 3, and you have the quantity of oxygen originally in the mixture.

What is the process when the quantity of nitrogen is to be determined? The method is to withdraw all other gaseous substances with which it is mixed.

What is the mode of determining the quantity of carbonic acid in gaseous mixtures?

By agitating the mixture with lime water, or a solution of caustic potassa, and noting the deficiency.

What is the mode of determining the quantity of hydrogen? By causing it to combine with oxygen by the electric spark, or platinum. The principle is the same for the inflammable gasses, chlorine being used for some of them instead of oxygen.

TABLE OF SYMBOLS, AND CHEMICAL EQUIVALENTS OF ELEMENTARY SUBSTANCES.

Ele.	*Eq.*	*Sy.*	*Ele.*	*Eq.*	*Sy.*
Alumiunim	13.7	Al	Mercury (Hydrargyrum)	202	Hg
Antimony (Stibium)	64.6	Sb	Molybdenum	47.7	Mo
Arsenic	37.7	As	Nickel	29.5	Ni
Barium	68.7	Ba	Nitrogen	14.15	N
Bismuth	71	Bi	Osmium	99.7	Os
Boron	10.9	B	Oxygen	8	O
Bromine	78.4	Br	Palladium	53.3	Pd
Cadmium	55.8	Cd	Phosphorus	15.7	P
Calcium	20.5	Ca	Platinum	98.8	Pt
Carbon	6.12	C	Potassium (Kalium)	39 15	K
Cerium	46	Ce	Rhodium	52.2	R
Chlorine	35.42	Cl	Selenium	39.6	Se
Chromium	28	Cr	Silver (Argentum)	108	Ag
Cobalt	29.5	Co	Silicium	7.5	Si
Columbium (Tantalum)	185	Ta	Sodium (Natrium)	23.3	Na
Copper (Cuprum)	31.6	Cu	Strontium	43.8	Sr
Fluorine	18.68	F	Sulphur	16.1	S
Glucinium	17.7	G	Tellurium	64.2	Te
Gold (Aurum)	199.2	Au	Thorium	59.6	Th
Hydrogen	1	H	Tin (Stannum)	58.9	Sn
Iodine	126.3	I	Titanium	24.3	Ti
Iridium	98.8	Ir	Tungsten (Wolfram)	94.8	W
Iron (Ferrum)	28	Fe	Uranium	217	U
Lead (Plumbum)	103.6	Pb	Vanadium	68.5	V
Lithium	6.44	L	Yttrium	32.2	Y
Magnesium	12.7	Mg	Zinc	32.3	Zn
Manganese	27.7	Mn	Zirconium	33.7	Zr

PART III.

MATERIA MEDICA AND PHARMACY.

What is Materia Medica? It is that science which treats of medicines.

What is Pharmacy? It is the art of preparing them for use.

What are medicines? They are substances capable of producing as an ordinary result, and by their own inherent power certain modifications of the vital functions, which render them applicable to the cure of disease.—*Wood*

How may their operation be divided? Into their primary and secondary operation.

In what way may the primary influence of medicines be exerted?

1st. By nervous communication.

2d. By entering the blood vessels, and acting through the medium of the circulation.

3d. By acting exclusively in the neighborhood of their application.

Have medicines in their operation an affinity for one part more than another? They have. Some substances act on the circulatory, nervous, or the absorbent system, and from the general distribution of these systems their action appears to be general. Others act upon the stomach, bowels, skin, kidneys, lungs, &c.; the primary action of which are considered to be local. This difference in their mode of action furnishes a basis for their division.

What influences affecting the system may modify the action of medicines? They are disease, climate, mode of

life, habit, age, sex, temperament, idiosyncrasies, and mental operations, which should all be attended to in making prescriptions.

What general rule is applicable in the doses of medicines according to age? For children under twelve years of age the doses of most medicines should be diminished in the proportion of the age to the age increased by 12. Thus at 2 years to 1-7; viz: $\frac{2}{2 \times 12} = 1\text{-}7$: at 4 years, to 1-4, viz: $\frac{4}{4 \times 12} = 1\text{-}4$. A full dose to be given at 21 years of age.

Paris's Pharmacologia.

Some medicines such as castor oil, calomel, &c. may require larger proportional doses.

What is meant by the secondary effects of medicines? They are changes which take place, not from the immediate operation of medicines, but depend upon certain laws of the system which modify the primary actions, and conditions; and are very important in the treatment of disease.

In what forms are medicines used? In powders, pills, troches, electuaries, confections, mixtures, solutions, decoctions infusions, wines, tinctures, vinegars, syrups, honeys, oxymels, liniments, cerates, ointments, plasters, cataplasms, and in the state of vapor.

To what parts of the body are medicines applied? To the stomach, rectum, skin, bronchial tubes and pulmonary air cells, nostrils, inside of the mouth, and by injections into the bloodvessels.

What are the objects in the application of medicines to the rectum? 1st. To produce alvine evacuations. 2d. To obtain their peculiar effects on the system.

In the latter case it should be given in small bulk, so that it may remain in the bowels. The relative dose administered in this way should be three times the ordinary quantity as a general rule. Medicines applied to the rectum are called suppositories when solid; and when liquid, clysters, injections, or enemata.

What are the modes of application to the skin? They are various. The skin may be retained, or removed; the medicine may be used in the form of vapor, liquid, or a soft solid, and may be applied to the whole surface of the body, or a part.

How are medicines applied to the bronchial tubes, &c? In the state of vapor.

What objects are to be gained by their application to the nostrils? A powerful excitement of the brain, and a strong revulsion from neighboring parts.

Classification.

Upon what principle is the preferable mode of classification founded? On the relations which medicines bear to the human system in a healthy state.

What is the first grand division in classification? Into medicines which act on the living body, and those which act upon foreign matters contained in the body.

How is the first grand division divided? Into those substances which act generally, and those which act locally.

How are the general remedies divided? Into stimulants or excitants, and sedatives.

How are stimulants divided? Into permanent, and diffusible.

How are the permanent stimulants divided? Into astringents, and tonics.

How are the diffusible stimulants divided? Into arterial stimulants, and cerebro-nervous stimulants.

The latter may be again divided into cerebral stimulants or stimulant narcotics, and into nervous stimulants or antispasmodics.

How are sedatives divided? Into arterial sedatives or refrigerants, and nervous sedatives or sedative narcotics.

How are the local remedies divided? Into those which affect the functions, those which affect the organization, and those which are mechanical in their action.

Those affecting the function of a part, are 1st Emetics; 2d. Cathartics; 3d. Diuretics; 4th. Diaphoretics; 5th. Expectorants; 6th. Emmenagogues; 7th. Sialagogues; and 8th. Errhines.

Those affecting the organization of a part, are 1st. Rubefacients; 2d. Epispastics; and 3d. Escharotics.

Those operating mechanically, are 1st. Demulcents; 2d. Emollients; and 3d. Diluents. Then there are mercury, iodine, arsenic, nux vomica, and ergot, which cannot be conveniently classified.

How is the second grand division divided? Into, 1st Antacids; and 2d. Anthelmintics.

TABULAR VIEW OF THE CLASSIFICATION

As adopted by Prof. Wood of the University of Pennsylvania.

Substances which act on the living body.
- General remedies.
  - Stimulants.
    - Permanent stimulants.
      - Astringents.
      - Tonics.
    - Diffusible stimulants.
      - Arterial stimulants.
      - Cerebro-nervous stimulants.
  - Cerebral stimulants, or stimulant narcotics.
  - Nervous stimulants commonly called antispasmodics.
  - Sedatives.
    - Arterial sedatives or refrigerents.
    - Nervous sedatives or sedative narcotics.
- Local remedies.
  - Affecting the functions,
    - Emetics.
    - Cathartics.
    - Diuretics.
    - Diaphoretics.
    - Expectorants.
    - Emmenagogues.
    - Sialagogues.
  - Affecting the organization.
    - Rubefacients.
    - Epispastics.
    - Escharotics.
  - Operating mechanically.
    - Demulcents.
    - Emollients.
    - Diluents.
- Medicines insusceptible of accurate classification.
  - Ergot.
  - Nux vomica.
  - Arsenic.
  - Mercury.
  - Iodine.

Substances which act on foreign matters contained within the body.
- Antacids, Anthelmintics.

Astringents.

What is an astringent? A medicine which produces contraction of the living fibre.

What are the general effects of astringents? They produce greater firmness of muscle, diminished calibre, greater rigidity of the blood vessels and absorbents, and a diminution or closure of secreting orifices and secretions generally. They produce moderate and permanent excitement of the organic life, but do not influence the nervous system much, or the functions of animal life.

When are astringents indicated? In unhealthy discharges from the blood vessels, and in cases generally which depend upon relaxation of the tissues.

When are they contra-indicated? By the existence of any morbid condition of which the discharge is a mere effect, and which it is calculated to relieve; and by the existence of any considerable local or general excitement.—In cases of excitement if it be desirable to suppress a discharge they should be preceded by bleeding, or other depleting measures. Their external use is governed with some modification by the same rules, but may be admissible locally, when their internal use would not be justifiable.

Under what circumstances may astringents be used locally in cases of inflammation? In the commencement of inflammation before the excitability is much increased; or in the latter stages after it has become in some measure exhausted.

How are astringents divided? Into the vegetable, and mineral.

The former have an identity of character depending upon similarity of composition, the latter agreeing only in the property of astringency.

Vegetable Astringents.

Upon what proximate principle do vegetable astringents owe their peculiar property? Tannin or tannic acid; and they differ only in the proportion of this principle, and in the character of the other ingredients associated with it.

What are the sensible properties of tannin? It is solid, uncrystallizable, white or slightly yellowish, strongly astringent without bitterness, and it precipitates many of the me-

talic salts, with iron forms a black compound, and is incompatible with gelatin, with which it forms a precipitate.

What is its dose? From 2 to 5 grs. every 3 or 4 hours.

What are the officinal species of Quercus in the United States, from which oak bark is derived? The Quercus alba or white oak; and the Quercus tinctoria or black oak, are the only ones officinal in the United States; but this genus contains about eighty species, thirty or forty of which are found in the United States.

How is the oak bark used? In powder, decoction, and extract.

What is the dose? Of the powder 30 grains; the decoction f℥ij; extract, 20 grains.

What are Galls, and where are they procured? Excrescences on the young branches of the Quercus infectoria and other species, produced by the puncture of the Cynips quercusfolii; the best are gathered early and are called blue, green, or black galls; the inferior are gathered later and are called the white galls.

They are brought from Asia Minor and neighboring countries.

How are galls generally used? As a local application externally, but may be used in powder, infusion, or decoction. and tincture. Dose of the powder 10 to 20 grains; of the infusion (made ℥ss, to Oj) ℥ij; of the tincture f℥ss to f℥iij.

What are incompatibles? Sulphuric and muriatic acids, gelatin, preparations irons, &c.

What are the varieties of Kino? They are the African, Jamaica, Botany Bay, and East India or Amboyna kino. The East India is the kind most used.

What are its general characteristics? As found in the shops it is in small irregular, angular, shining fragments of a dark reddish brown, or black color, and easily pulverizable; contains tannin, and extractive matter.

What are its medical properties and uses? It is powerfully astringent, and is much used where astringents are indicated. It may be given in powder, infusion, or dissolved in diluted alcohol. Dose of powder from 10 to 30 grains; of infusion (made by ℥ij extract, and boiling water ℔ss) f℥j; the amount of alcohol in the tincture renders it objectionable. Incompatibles same as galls.

From what is the Catechu procured? It is an extract of the wood of the Acacia Catechu, and comes from Hindostan.

What are the general characters of catechu? It comes to us in masses of different shapes, of a rusty brown, varying from a reddish or yellowish brown to a dark liver color; contains tannin, extractive, and mucilage.

What are its medicinal properties, and uses? It is tonic, powerfully astringent, and may be given where astringents are indicated. Dose from 10 grains to ʒss, and repeated frequently. Incompatibles same as galls.

From what is Rhatany obtained? From the root of the Krameria triandria. It is a native of Peru.

What are the general characters of rhatany? It comes to us in pieces of various shapes, and dimensions, often cylindrical, and two or three feet in length. The mineral acids, and most of the mineral salts are incompatible. Cold water by displacement extracts all the astringency from it.

What are its medicinal properties, and uses? It is a gentle tonic, powerful astringent, and may be given where astringents are indicated. Dose of powder from 20 to 30 grs. of infusion, or decoction (made ʒj of bruised root to Oj of water), fʒj; of extract 15 or 20 grains; tincture fʒj to fʒiij; and syrup fʒss.

From what is the Logwood procured? From the Hæmatoxylon Campeachianum, and is brought from Campeachy, the shores of Honduras Bay, and other parts of tropical America.

What are the general characteristics of logwood? It is hard, compact, heavy, of a deep red color, becomes dark by exposure, and has a sweetish astringent taste. Its peculiar principle is *hematine*.

What are its medical properties and uses? It is a mild astringent, well adapted to relaxed, and enfeebled conditions of the bowels.

It is given in decoction, and extract, both of which are officinal. Dose of the decoction fʒij; of the extract 10 to 20 grains.

From what is the Cranesbill derived? From the Geranium maculatum, an indiginous, perennial, herbaceous plant, growing in woods. The root is the part used, and should be collected in autumn; active principle, *tannin*.

What are its medical properties, and uses? It is a powerful astringent, and may be employed where they are indicated; it is very free from unpleasant qualities, which renders it serviceable for infants, and may be given in substance,

decoction, tincture, or extract. Dose of powder 20 or 30 grs; decoction (made ʒj to Ojss boiled to Oj), from fʒj to fʒij.

It is frequently given to children, boiled in milk.

What is the officinal name of the plant furnishing the Blackberry root, and the Dewberry root? The Rubus Villosus, and Rubus Trivialus, the virtues of which reside in the bark of the root.

What are their medicinal properties and uses? Tonic, and strongly astringent. The decoction is prepared the same as the preceding article, and given in the same dose. Dose of powder, 20 to 30 grains.

What is the plant furnishing the Uva Ursi? The Arbutus Uva Ursi, a small trailing evergreen shrub, growing plentifully in the U. S. as far south as New Jersey. The leaves are the part used.

What are the general properties of the leaves? They are inodorous when fresh, smell like hay when dried, have a bitterish taste, strongly astringent, and afterwards sweetish. The active ingredients are tannin, bitter extractive, resin, gum, and gallic acid.

What are its medical properties and uses? It is astringent, tonic, and thought by some to have a specific direction to the urinary organs. Dose of powder is from ℈j to ʒj; Decoction ʒj to ʒij, 3 or 4 times a day.

What portion of the Pipsissewa or Chimaphila umbellata is used in medicine? The leaves, and stem. It is a small indigenous evergreen plant growing in the north of Europe, Asia, and America; inhabiting the woods.

What are their general properties? The taste is pleasantly bitter, astringent, and sweetish. Boiling water and alcohol extract the active properties of the plant, which are tannin, and bitter extractive.

What are its medical properties and uses? Diuretic, tonic, and astringent. It is generally used in decoction, ʒj to Ojss of water boiled to Oj and taken in 24 hours.

Mineral Astringents.

What is the chemical composition of Alum? It is a sulphate of alumina, and potassa.

What are the incompatibles? The alkalies, lime, magnesia, and their carbonates; tartrate of potassa, and acetate of lead.

What are its medical properties and uses? Astringent,

in ordinary medicinal doses, but purgative in large doses. It is used internally, and locally. The ordinary dose is from 10 to 20 grains repeated every two or three hours.

What are the preparations of Lead used medicinally? They are the Litharge or Plumbi Oxidum Semivitrium, the Carbonate, the Acetate, and Sub-acetate.

What are the effects of the combinations of lead? They are sedative, and astringent, and produce poisonous effects, if taken in large doses, or long repeated. The sulphate, and probably the acetate are exceptions to this. Sulphuric acid, sulphate of soda, and sulphate of magnesia are antidotes.

What are the general properties of the Acetate of Lead? It is a white salt crystalized in brilliant needles. Its taste is sweet, and astringent. It is liable to be decomposed by water containing carbonic acid, but is redissolved by acetic acid.

What are its incompatibles? It is decomposed by all acids, soluble salts the acids of which produce insoluble or sparingly soluble compounds with the protoxide of lead, lime water, ammonia, potassa, and soda. Sulphuretted hydrogen gives a black precipitate, and iodide of potassium a yellow one.

What are its medical properties and uses? In medicinal doses it is powerfully astringent, sedative, and in large ones an irritant poison.

It is administered in hemorrhages of the lungs, intestines, and uterus. By giving acetic acid combined with it the formation of a carbonate is prevented upon which its poisonous qualities are supposed to depend.

Dose is from 1 to 3 grains, repeated as required.

What is the white lead? It is the carbonate; and is only employed externally, being used as an application to ulcers, and excoriated surfaces. It is the most poisonous of the preparations of lead, producing the disease called colica pictonum.

What is Goulard's extract of lead? It is a solution of the subacetate of lead, formed by the acetate of lead ℥xvj, semivitrified oxide of lead ℥ixss, distilled water four pints, boiled, filtered, and diluted in the proportion of ℥ij to a pint.

Tonics.

What is meant by Tonics? They are medicines which produce gentle, and permanent excitement of the vital actions·

When are tonics injurious? In the healthy state, and in diseases of excitement.

They may diminish excitability, or natural healthy power; or, produce an irritation which may be followed by inflammation.

Under what circumstances are tonics indicated. In cases in which the vital actions are depressed below the standard of health. They invigorate the system in a two-fold manner; 1st. by increasing the energy of the stomach; and 2d. by a direct influence over the whole frame, producing an elevation of all the vital actions.

How may tonics be divided? Into the pure bitters; bitters peculiar in their properties; aromatics; and mineral tonics.

What are the effects of the Pure Bitters? They increase the appetite, invigorate digestion, have little influence over the circulation, unless in large doses, and exhibit but little evidence of action on the nervous system.

What are the effects of Bitters peculiar in their properties? They are generally more stimulating than the pure bitters.

What are the effects of the Aromatics? They depend upon the presence of volatile oil, are more stimulating than the bitters, and approach nearer to the diffusible stimulants.

What are the peculiarities of the Mineral Tonics? They have no common peculiarity except the tonic property, each having peculiarities which serve to distinguish it from the others.

Pure Bitters.

From what is Quassia derived? It is the wood of the Quassia excelsa, and Quassia amara, trees of the West Indies.

What are the general characteristics of quassia? The wood is whitish, and yellowish by exposure; has a purely bitter taste; the active principle is *quassin.*

What are its medical properties, and uses? It has the properties of the simple bitters in their highest degree. It is particularly useful in dyspepsia from debility of the stomach. It is given in infusion in the proportion of ʒij to Oj cold water. Dose fʒij 3 or 4 times a day; of extract, from 2 to 5 grains; of tincture fʒj to fʒij.

From what is the Gold Thread procured? It is the root of the Coptis trifolia.

What are its medical properties, and uses? It is a simple tonic bitter, closely analagous to quassia. Dose of powder 10 to 30 grains; tincture f℥j.

From what is Gentian procured? It is the root of the Gentiana lutea, which grows on the Alps, and other mountains; the active principle of which is *gentianin.*

What are the general properties of the root? The taste is slightly sweetish, and intensely bitter. Water, and alcohol extract the taste, and medical virtues from It.

What are its medical properties, and uses? It possesses in a high degree the tonic power of the simple bitters, excites the appetite, invigorates the power of digestion, increases the temperature of the body, and the force of the circulation.

It is given in powder, dose 10 to 40 grains; in infusion, (℥ss to Oj), f℥i to f℥ij; of tincture, f℥j to f℥ij; of extract, 5 to 30 grains.

What portion of the Sabbatia angularis or American Centaury is used? The whole plant. It grows in the middle, and southern states in low meadows, and should be collected when in flower.

What are its medical properties, and uses? It has the tonic properties of the simple bitters. Dose of the infusion (℥j to Oj), f℥ij.

What plant is the Columbo derived from? The Coculus palmatus. The root is the part used, and is brought from Africa.

What are its general properties? As it comes to us it is in flat, circular, or oval pieces, of a bitter taste, and slightly aromatic odor. Active principle *columbin.*

What are its medical properties, and uses? It is a useful mild tonic, no astringency, and but slightly stimulant. Used in powder, infusion, and tincture. Dose of the powder 10 to 30 grains; of infusion (made in the proportion of ℥ss to Oj) from f℥j to f℥ij; of tincture f℥ss to f℥j.

Bitters of peculiar, or modified properties.

From what is the Peruvian Bark obtained? Different species of the Cinchona, brought from the western coast of South America.

There are three officinal varieties: 1. pale bark; 2. yellow bark; and 3. red bark.

The pale embraces the varieties called Loxa, and Lima;

the yellow is called in commerce Callisaya bark, and of which there are two varieties, the quilled, and flat.

The red is divided into the quilled, and the flat also.

What are the active principles of bark? Quinia, and Cinchonia combined with kinic acid.

What preparation of bark is generally used? The sulphate of quinia.

What are the medical properties and uses of cinchona? It is one of the most valuable tonics we possess; as well as anti-intermittent. The best mode of giving the bark is in substance; dose of the powder ℥j.

What is the comparative power of sulphate of quinine compared with the bark? 10 to 14 grains is equivalent to ℥j of good bark. It is given in intermittents in doses of 12 to 18 grains, in the interval of the paroxysm. As a mere tonic ¼ to ½ a grain 3 or 4 times a day.

From what do we procure the Dog wood bark? From the Cornus Florida, an indigenous tree. The dose and mode of using similar to the peruvian bark.

What is the officinal name of the tree from which the Wild Cherry bark is procured? Prunus Virginiana—indigenous to this country.

What are the active principles? Hydro-cyanic acid, tannin and bitter extractive.

What are its medical properties and uses? It is tonic, and sedative; lessens the action of the heart and arteries; and is useful in the hectic fever of scrofula and consumption. Dose of powder ℥ss. to ℥j; of the infusion f℥ij 3 or 4 times a day.

What is the officinal name of the Chamomile? Anthemis nobilis; the flowers are the parts used, although all parts of the plant are active. The active principle is bitter extractive, and volatile oil.

In small doses it is tonic, and in large ones emetic. The cold infusion is best when used as a tonic in doses of f℥ij; dose of the powder ℥ss. to ℥j.

What are the medical properties and uses of the Eupatorium perfoliatum or Thoroughwort? It is tonic, diaphoretic, and taken in large doses it acts as an emetic, and aperient. As a tonic it should be administered in substance or cold infusion. Dose of the powder 20 or 30 grains; and of the infusion ℥i frequently repeated. As a diaphoretic it should be given warm. As an emetic and cathartic in doses of one or two gills of the strong decoction.

What are the medical properties and uses of the Aristolchia Serpentaria or Virginia Snake Root? It is indiginous; the root is the part used, and its active ingredients are a bitter principle, and volatile oil. It is a stimulant tonic acting also as a diaphoretic, or diuretic according as it is administered.

Dose of the powder 10 to 30 grains; infusion f℥j to f℥ij every 2 or 3 hours; officinal tincture f℥i to f℥ij.

From what is Myrrh procured? It is an exudation from the Amyris Myrrha. There are two varieties; the India and Turkey.

What are its medical properties and uses? Its active principle is a resin and volatile oil. It is a stimulant tonic, with a tendency to the lungs, and also to the uterus. Employed in diseases of these organs where there is no febrile excitement or acute inflammation. Used in powder and pill in dose of 10 to 30 grains; of the tincture f℥ss. to f℥j

What are the medical properties and uses of the bark of the Gallipea officinalis, or Angustura? Its active parts are bitter extractive, and volatile oil. It is a stimulant tonic, but little employed in the United States. Dose of the powder 10 to 20 grains, infusion f℥ij; tincture f℥j to f℥ij.

False Angustura bark has poisonous properties; its active ingredient is *brucia*.

What are the medical properties and uses of the bark of the Croton Elutheria, or Cascarilla? Its active ingredients are extractive and volatile oil. It is an aromatic tonic, and is now only employed where a gentle stimulant tonic is desired. Dose of the powder 20 to 30 grains; of the infusion f℥ij.

Aromatics.

What are the general properties of aromatic tonics? They owe their characteristics to volatile oils, are more stimulant than tonics generally; and more local in their action than diffusible stimulants, relieve pains in the stomach and bowels, expel flatulence, &c. Decoctions and extracts objectionable.

What are the medical properties and uses of Orange Peel, or rind of the fruit of the Citrus Aurantium? It is a mild tonic, stomachic, and carminative; given in infusion.

What are the properties of the prepared bark of the Laurus Cinnamomum or Cinnamon? There are two varieties,

the Ceylon cinnamon, and China cinnamon, or cassia. Its active principles are volatile oil and tannin; its medical use the same as aromatics in general, applicable in cases requiring astringents.

Dose of powder 10 to 20 grains; tincture f℥j.

What are the properties of the bark of the Canella alba? Its active ingredients are volatile oil, and bitter extractive; used generally combined with other articles. It is an ingredient in the powder of Aloes and Canella or hiera picra.

From what are Cloves derived? They are the unexpanded flower buds of the Eugenia Caryophyllata or Caryophylus Aromaticus; brought from the West Indies and the European colonies of Guiana.

What are their medical properties? Their active principle is a volatile oil. They are used where a stimulant aromotic is indicated Dose of the powder 5 to 10 grains; infusion made with (℥ij to Oj, ℥ij;) oil 2 to 5 drops; used in several officinal preparations.

From what is the Nutmeg procured? It is the kernel of the fruit of the Myristica Moschata growing in the Moluccas.

What are its medical properties and uses? The active principle is a volatile oil; it also yields a fixed oil called the Oil of Mace. It combines narcotic with aromatic properties. Dose of powder 5 to 10 grains of volatile 2 or 3 drops.

From what is the Black Pepper obtained? It is the dried berries of the Piper Nigrum.

What are its properties and uses? It contains a volatile oil, an acid concrete oil, and *piperin*. Its activity depends upon its oils, and not the piperin, which is inert when pure. It is a warm carminative stimulant, and used where such properties are indicated.

From what are Cubebs obtained? It is the dried fruit of the Piper Cubeba a vine growing in the East Indies.

What are its properties and uses? Its active ingredient is a volatile oil.

It is aromatic, and diuretic. Dose of the powder ℥ss. to ℥iss 3 or 4 times a day; of the volatile oil 10 to 20 drops.

From what is the Pimento obtained? The Myrtus Pimento. The active properties reside in a volatile, and fixed oil; dose of the oil 3 to 6 drops.

What are the properties and uses of Cardamom, or the fruit of the Alpinia Cardamomum? It is a warm aromatic,

less heating and stimulating than some others. It enters into a number of officinal preparations. Dose of the compound tincture f℥j.

What other aromatic seeds are used in medicine? Fennel, Caraway, Coriander, Anise.

What is the dose of the compound spirit of Lavender? The dose is f℥ss. to f℥j.

What is the officinal name of the Peppermint? Mentha Piperita. Dose of the oil 1 to 3 drops; of the essence 10 to 20 drops.

What is the officinal name of the Spear Mint? Mentha Viridis and possesses properties similar to the last.

What other herbaceous aromatics are used in medicine? The Hedeoma pulegioides, or Pennyroyal. Melissa officinalis or Balm.

Origanum vulgare, or Origanum, and the Gaultheria procumbens, or Partridge berry.

From what is Ginger procured? It is the root of the Zingiber officinale, an herbaceous plant, native of the East Indies, and cultivated in the West Indies.

What are its properties and uses? It is aromatic, spicy, pungent, hot, and biting. Its virtues are extracted by water and alcohol.

It is a grateful stimulant, and carminative; and may be given in powder, in doses of 10 to 30 grains; in infusion f℥ij; in tincture f℥j or f℥ij.

In what doses is the Acorus Calamus or sweet flag used? Its uses, modes of administration, and doses are similar to those of the ginger.

Mineral Tonics.

What are the properties of the preparations of Iron? They are highly tonic, raise the pulse, promote the secretions, and increase the coloring matter of the blood. The disease in which they are most used are chlorosis hysteria, flour albus, gleet, scrofula, rickets, &c.

What are the doses of the different preparations of Iron? The Filings—Ramenta ferri—in doses of 5 to 10 grains. Scales—Squamae ferri—5 to 20 grains. Prepared Carbonate—Ferri Carbonas Praeparatus; Precipitated Carbonate—Ferri Carbonas Praecipitatus. Dose of the two last 5 to 20 grains; in neuralgic cases from ℥ss to ℥j 3 times a day, and increased.

Sulphate—Ferri sulphas—Green vitriol—Copperas—in doses of from 1 to 5 grains; of the dried from ½ to 3 grains, 3 or 4 times a day.

What are the incompatibles of the sulphate? The alkalies, and alkaline carbonates, muriate of lime and baryta; nitrate of silver; acetate of lead, tannin, &c.

Tincture of the Muriate—Tinctura Ferri Muriatus—dose 10 to 30 minums 3 or 4 times a day. Tartrate of Iron and Potassa—Ferri et Potassae Tartras—dose 10 to 30 grains. Phosphate 5 to 10 grains.

What is the effect of the preparations of Copper on the system? In its pure state it is inert, but in combination highly poisonous; in small quantities but little sensible effect is produced, except a slightly tonic influence.

When taken in poisonous doses they produce a coppery taste in the mouth, nausea, vomiting, violent pain in the stomach and bowels, black and bloody stools, irregular pulse, faintings, thirst, difficulty of breathing, cramps, convulsions, and death. The best treatment in these cases is to administer white of eggs in water in large quantities.

What are the doses of the different officinal preparations of Copper? Sulphate—Cupri Sulphas—Blue Vitriol. Dose ¼ of a grain 2, 3 or 4 times a day, given in pill, and omitted if the stomach becomes irritated. Ammoniated Copper—Cuprum Ammoniatum.—Dose ½ a grain twice a day.

What are the preparations of Zinc used medicinally? The Sulphate, Oxide, impure Oxide, and Carbonate.

What are the medical properties and uses of the Sulphate of Zinc? It is tonic, astringent, and in large doses a prompt emetic. Dose as a tonic ½ grain to 2 grains; as an emetic 10 to 30 grains.

What are the incompatibles? Alkalies and their carbonates, hydro-sulphates, lime water, and astringent vegetable infusions.

What preparations of Bismuth are used medicinally? The Subnitrate, or White Oxide; it is tonic, and antispasmodic. Dose 3 to 10 grains in powder or pill.

What preparations of Silver are used medicinally? The Nitrate, Oxide, and Chloride.

What are the medical properties of the Nitrate of Silver? As an internal remedy it is tonic, and antispasmodic. It has been employed in epilepsy, chorea, angina pectoris, &c. Externally it is a vesicant, stimulant, and escharotic. Dose

¼ of a grain increased to 4 or 5, three times a day in pills. The proper antidote for a large dose is common salt.

What are its incompatibles? Its incompatibles are common salt, alkalies and their carbonates, lime water, mineral acids, astringent vegetable infusions, &c.

What preparation of Sulphuric acid is used medicinally? The Diluted, and the Aromatic. Dose of each 10 to 30 drops. They increase the appetite, and promote digestion.

What are its incompatibles? Its incompatibles are the alkalies, alkaline earths, their carbonates, &c.

What are the effects and dose of Nitric acid? It is tonic, and refrigerant when diluted; concentrated, it is a corrosive poison. Dose, 2 to 5 drops in water.

What are its incompatibles? Its incompatibles are the alkalies, alkaline earths, their carbonates, sulphate of iron, the salts of lead, &c.

What is the dose of the Nitro-Muriatic acid? From 2 to 10 drops 3 or 4 times a day.

Arterial Stimulants.

What are the medical properties and uses of the Cayenne Pepper or Capsicum Annuum? It is a powerful stimulant, without being narcotic; useful in enfeebled, and languid stomachs; active principle *capsicin*. Dose of powder 5 to 10 grs; of infusion [℥ij to Oss.] f℥ss; of tincture f℥j to f℥ij; used also as a gargle.

What are the medical properties and uses of Spirits of Turpentine or Oil of Turpentine? It is stimulant, diuretic, anthelmintic, and in large doses cathartic. Dose, 5 to 20 drops repeated.

What is the dose of Phosphorus? It is 1-12 of a grain in oleaginous, or etherial solution.

What are the properties, and dose of Carbonate of Ammonia? It is stimulant, diaphoretic, and antispasmodic.

The dose as a stimulant is from 5 to 10 grs., in pills, or emulsion, and repeated. It is one of our best stimulants in low fevers, &c.

Nervous Stimulants or Antispasmodics.

From what is Musk obtained? It is obtained from the Moschus Moschiferus an animal resembling the deer, found in Asia.

What are its medical properties, and uses? It is stimulant, and antispasmodic, and used in cases where these qualities are indicated, particularly in low states of the system. Given in pill, and emulsion. Dose 10 grains.

How is artificial musk prepared? By the action of nitric acid on amber.

From what is Castor obtained? It is a peculiar product of the Castor fiber or Beaver. It is not much used. Dose in substance 10 to 20 grains; in tincture f℥j to f℥ij.

From what is Assafœtida procured? It is the inspissated juice of the Ferula Assafœtida.

What are its medical properties and uses? Its active part is a resin, and volatile oil. It is a moderate stimulant, powerful antispasmodic, an expectorant, and feebly laxative. Dose 5 to 20 grains in pill, or emulsion; of the tincture f℥j.

From what is Valerian obtained? It is the root of the Valeriana officinalis, a native of Europe.

What are its medical properties and uses? It is a gentle stimulant, with a narcotic effect. It is used in hysteria, hypochondriasis, &c. Active principles a *volatile oil*, and *volatile acid* called *valerianic*.

Dose of the powder 30 to 90 grains; of the infusion (℥j to Oj), f℥ij; of the tincture f℥j to f℥iv; of the oil 4 to 6 drops.

What are the properties and uses of the Oil of Amber? It is stimulant, and antispasmodic, and used as a liniment. Dose 5 to 10 drops in emulsion.

What other nervous stimulants do we possess? Garlic, Tea, and Coffee, Skunk Cabbage, &c.

Cerebral Stimulants called also Narcotics from the stupor which they produce in large doses.

How is Alcohol produced? By the vinous fermentation.

What are its medical properties and uses? It is a powerful stimulant, and is the intoxicating ingredient in all spirituous and vinous liquors. It is not used in medicine in a pure state; diluted it is extensively used as a menstruum.

What Wines are used medicinally? Madeira, Teneriffe, Sherry; and Port when an astringent is indicated.

How is Sulphuric Ether procured? By the distillation of alcohol and sulphuric acid.

What are its medical properties and uses? It is a transient, powerful, diffusible, stimulant; and given where such medicines are indicated. Dose f℥ss to f℥j.

From what is Opium obtained? It is the concrete juice of the Papaver somniferum

Of what is it composed? Morphia, narcotina, codeia, meconic acid, gum, extractive, resin, &c.

What are its incompatibles? All vegetable infusions containing tannin, and the alkalies.

What are its medical properties and uses? It is a stimulant narcotic. It diminishes the peristaltic action of the bowels, and all the secretions except of the skin; allays inordinate muscular contractions, and general nervous irritation. Medium dose in substance is 1 grain; of the tincture 25 drops; of the camphorated tincture f℥i, f℥j of which contains 2 grains of opium; of the acetated tincture 20 drops which is equal to 1 grain of opium; of the sulphate, acetate and muriate of morphia 1-6 of a grain is equal to 1 grain of opium.

From what is Lactucarium procured? It is the inspissated milky juice of the Lactuca sativa. Dose 2 to 3 grains.

From what is Henbane procured? From the Hyosciamus Niger. Leaves and seeds, officinal.

What are its properties and uses? Its active principle is *hyosciamin* or *hyosciamia*. It is narcotic in large doses; in small ones it gently accelerates the circulation, and increases the general warmth; it does not constipate.

Dose of leaves 5 to 10 grains; of extract which is mostly used 2 or 3 grains; of tincture f℥j.

From what are Hops procured? They are the strobiles of the Humulus Lupulus.

The active principles are a volatile oil, and a peculiar bitter principle.

What is Lupulin? It is a yellowish powder obtained separate by rubbing and sifting the strobiles. Its bitter principle is called *lupulite* or *lupuline*.

What are their medical properties and uses? Tonic, moderately narcotic, and used in diseases of debility where morbid vigilance exists.

Dose of the infusion of hops (made with ℥ss to Oj of water) is f℥ij; of the tincture f℥i to f℥ss, of the lupulin 6 to 12 grs in piil; of the tincture f℥j to f℥ij.

From what is Camphor derived? From the Laurus Camphora, an evergreen growing in China and Japan. It is procured by sublimation from the roots and smaller branches.

What are its properties and uses? It is very volatile, and

may be sublimed unchanged. The medium dose is 5 to 10 grs. in emulsion. It enters into the composition of several linaments.

What is the active principle of Atropa Belladonna or Deadly Nightshade? An alkaline principle called *atropia*.

The leaves of the plant are the part used. Dose of the powdered leaves 1 gr. night and morning; of the infusion (℈j to ℥x of water) f℥j to f℥ij; of the extract, which is the inspissated juice ¼ to ½ a grain twice a day, and increased if necessary. It is used in the form of plaster, and as an application to the eye, and the os uteri.

What part of the Datura Stramonium or Thorn Apple is used medicinally? The leaves, and the seeds. The active alkaline principle is *daturia*.

What are its medical properties and uses? It is a powerful narcotic, and sometimes used in epilepsy. Dose of the seeds 1 gr; of extract from seeds ¼ to ½ a grain; of the powdered leaves 2 to 3 grs; of the extract of the leaves 1 gr. Used also as an ointment.

What is the dose of the Dulcamara or Bittersweet? Of the officinal decoction f℥ij, 4 times a day; of extract 5 to 10 grs. Active principle *solania*.

What is the dose of the Conium maculatum or Hemlock? Of the powdered leaves 3 or 4 grs; of the extract or inspissated juice of the leaves 3 grs.

Arterial Sedatives.

What preparations of Antimony are employed medicinally? The tartar emetic, precipitated sulphuret, and antimonial powder.

What are the properties and uses of Tartar Emetic or the Tartrate of Antimony and Potassa? It is the most important of the antimonials. Its general action is sedative on the circulation, while it excites many of the secretions. It may produce an alterative, diaphoretic, diuretic, expectorant, purgative, and emetic effect, according as it is administered. Applied externally it acts as a counter irritant.

Its dose as an alterative is from 1-32 to 1-12 of a grain; as a diaphoretic, or expectorant from 1-12 to 1-6 of a grain; as a nauseating sudorific from ¼ to ½ gr. repeated as occasion requires; as a purgative 1-6 of a grain combined with Epsom salts ℥j, and repeated every two or three hours; as an emetic from 2 to 4 grains given in divided portions at intervals of 10 or 15 minutes.

The antimonial wine contains 2 grs. of tartar emetic to fʒj.

What are its incompatibles? Mineral acids, the alkalies and their carbonates, sulphurets, lime water, and vegetable astringents.

What is the dose of the Precipitated Sulphuret? As an alterative 1 to 2 grs; as an emeto-cathartic 5 to 20 grains.

What is the dose of the Antimonial Powder used in imitation of James' powder? From 3 to 8 grains.

What other medicines are used as arterial sedatives? Nearly all the neutral alkaline salts, and those in which the acid predominates; they are usually called refrigerants, the most prominent of which is nitrate of potassa. Dose 5 to 10 grains every hour or two, in powder or solution. It is frequently combined with tartar emetic.

The Vegetable acids are also refrigerant or arterial sedatives.

Nervous Sedatives.

To what class of diseases are nervous sedatives applicable? To complaints attended with nervous disorder, and unhealthy excitement of the heart and arteries.

What are the medicinal properties and uses of the leaves of the Digitalis purpurea or Foxglove? It is narcotic, sedative, and diuretic.

It is best given in substance. Dose 1 grain twice or three times a day; of the officinal infusion fʒss; of the tincture 10 drops, which is equivalent to 1 gr. of the substance. It requires caution in its exhibition.

In what preparations is the Hydrocyanic or Prussic acid found? In the Cherry Laurel water, and in the Oil of Bitter Almonds.

What are its properties and uses? It is a deadly poison; one or two drops of the pure acid is sufficient to prove fatal. The medicinal article is diluted, and may be given in doses of from 1 to 6, or 8 drops in distilled water, gum water, or syrup. It should be administered with caution, commencing with the smallest dose. The antidotes are chlorine, ammonia, cold affusion, and artificial respiration.

What is the active principle of the Nicotiana tabacum or Tobacco? *Nicotia.*

What is the quantity given as an injection? Infusion, made of ʒss to Oss at a time.

EMETICS.

What are emetics? Medicines capable of producing vomiting in certain doses, and as an ordinary result.

What are the therapeutical effects of emetics? Evacuation of the stomach, mechanical pressure on the abdominal viscera, reduction of arterial action during the period of nausea, muscular relaxation, promotion of the secretory functions of the skin, liver, and lungs, powerful agitation of the whole frame, purgation frequently, revulsion to the stomach, depletion, and irritation of the stomach.

What are the circumstances contra-indicating the use of emetics? Acute inflammation of the stomach, bowels, or neighboring viscera; strong sanguineous determination to the brain; and pregnancy in the advanced stages. Caution should also be observed in cases of hernia.

From what is Ipecacuanha obtained? It is the root of the Cephælis Ipecacuanha, growing in South America.

What are its properties and uses? In large doses it is emetic; in smaller, diaphoretic, and expectorant; in still smaller, stimulant to the stomach promoting its healthy actions. Its active principle is *emetia*. It is mild, and certain in its operation Dose as an emetic 15 to 30 grains; as a nauseant 2 to 3 grains; as a diaphoretic, ½ to 2 grains; as an alterative, ½ gr. repeated 2, 3, or 4 times a day.

The Wine of Ipecacuanha is emetic in doses of f℥j to an adult, and f℥j to an infant.

What is the dose of the root of the Gillenia trifoliata Indian physic or American Ipecacuanha? From 20 to 30 grs.

What are the properties and uses of the Lobelia inflata or Indian Tobacco? Besides emetic, diaphoretic, and expectorant properties it has narcotic properties. The whole plant is active. It bears a close resemblance in its effects to tobacco. It is too powerful and distressing as well as hazardous in its operation for ordinary use. Dose of the powder from 5 to 20 grs. as an emetic; of the tincture f℥j to f℥ij every two or three hours until it acts.

What other vegetable substances possess the property of producing vomiting, and are occasionally used for that purpose? The root of the Euphorbia Ipecacuanha in doses of from 10 to 15 grains.

The root of the Sanguinaria Canadensis; active ingredient *sanguinarina*. Dose of the powder from 10 to 20 grains; of the tincture f℥iij to ℥ss.

The Squill; in dose of 6 or 8 grains.

Tobacco; dose of the powder 5 or 6 grains.

Mustard in powder; dose ʒj.

What is the character of Tartar Emetic as an emetic? It is characterized by certainty, strength, and permanency, of operation. It remains in the stomach longer than ipecacuanha, and exerts a more powerful impression on the system generally.

Dose 2 to 4 grains given in divided portions; 1 grain with 10 of ipecac repeated if necessary, makes a good emetic; of the wine fʒss to fʒi repeated if necessary; for a child 1 or 2 years old, 20 to 40 drops.

What are the characteristics of the Sulphate of Zinc as an emetic? It is charactetized by promptness and comparatively little nausea. Used chiefly as a mere evacuant of the stomach in cases requiring a prompt and energetic emetic; as in narcotic poisons, when it should be combined with ipecacuanha. Dose 10 grains to ʒss.

What are the characteristics of the Sulphate of Copper as an emetic? It is characterized by promptness, and slight nausea more prompt and powerful than the last article. Seldom used except in narcotic poisoning where it is given in doses of 5 to 15 grains.

Cathartics.

What are Cathartics? They are medicines which pro duce evacuations from the bowels. They operate; 1. by irritating the mucous membrane of the bowels; 2. by stimulating the exhalent vessels and mucous follicles; and 3. by stimulating the liver. Some act one way, and some another, and some by a combined action.

Do they operate on all parts of the alimentary canal alike? No: some operate on one portion, and some on another, and others on the whole.

What is meant by a hydragogue cathartic? A cathartic which produces large watery evacuations.

How are cathartics divided? Into laxatives, purges, and drastics or drastic purges.

In what way are cathartics useful in disease? They evacuate the bowels and relieve constipation; they directly deplete from the blood vessels; promote absorption; act as revulsives; and some by increasing the secretions from the liver, and thereby relieving congestion.

Is the action of cathartics modified by combination? It is; by mixing several drastics together they become milder without loss of purgative power. Small doses of emetic substances promote their operation; the same effect is also produced by bitters. Their tendency to gripe may be lessened by aromatics.

Vegetable Cathartics.

From what is Manna procured? It is the concrete juice of the Fraxinus Ornis growing in the south of Europe. There are three varieties: flake, common, and fat manna

What are its medical properties and uses? It is a gentle laxative. Dose ʒj to ʒij. Active principle *mannite.*

What are the properties and uses of the Cassia Fistula or Purging Cassia? The pulp of the pods is the medicinal portion. It is gently laxative, and given in cases of habitual costiveness. It is an ingredient in the confection of senna.

Dose ʒss to ʒj.

What plant produces the Castor Oil? The Ricinus Communis, a native of Africa but cultivated in Europe and in this country. The oil is obtained from the seeds by expression.

What are its medical properties and uses? It is a mild cathartic, speedy in its action, and good to remove accumulation of feces in the bowels.

Dose for an adult fʒj; children require more in proportion than adults.

From what is Rhubarb obtained? It is the root of different species of Rheum; of which we get three varieties, the Russian, Chinese, and European. The Chinese is the most used, but the Russian is the best. The active principles are *rhubarbarin* and tannin.

What are its medical properties and uses? It combines a cathartic and astringent power; it is tonic and stomachic in small doses; roasting increases its astringent, and decreases its purgative effects. Dose as a stomachic and laxative 5 to 10 grains; of the European variety the dose should be double. There are numerous officinal preparations of rhubarb.

From what is Senna obtained? It is the leaves sf several species of Cassia. There are three commercial varieties—Alexandria, Tripoli and India Senna.

What are its properties and uses? It is a prompt efficient and safe purgative.

Its active principle is *cathartin*. Dose of the powder ʒj; generally given in infusion, which is officinal and given in doses fʒii every 4 or 5 hours. The elixir salutis is a tincture of Senna and Jalap. Dose fʒij to fʒss.

Dose of Confection of Senna ʒj to ʒss.

What is the properties and dose of the Cassia Marylandica or American Senna? It is similar in properties to senna, but weaker; dose ½ greater.

What are the properties and uses of the extract of the Juglans cinerea? It is a mild cathartic, operating without pain, and evacuating the alimentary canal without debilitating.

Dose 20 to 30 grains as a purgative, and 10 or 12 grains as a laxative.

From what is Aloes procured? It is the inspissated juice of different species of Aloe.

There are three commercial varieties, Cape, Socotorine, and Hepatic Aloes.

What are its properties and uses? It is cathartic, operating slowly, but certainly, and has a peculiar affinity for the large intestines.

It also has a tendency to the uterine system. Dose as a laxative from 2 to 6 grains; as a purgative 10 to 15 grains. It is usually given in pill. There is a large number of officinal preparations of aloes.

From what is Jalap obtained? It is the root of the Ipomea Jalapa, a vine, native of Mexico.

What are its properties and uses? It is an active cathartic, operating briskly, and sometimes with pain, producing copious watery stools.

Dose of the powder 15 to 30 grains; of the resin of jalap 8 to 10 grains; of the extract 10 to 20 grains.

What are the properties and uses of the Podophyllum peltatum? It is an active, certain cathartic, produces copious liquid discharges without much griping, or other unpleasant effect. It resembles jalap in its operation, and is applicable whenever a brisk cathartic is required. The dose of the powdered root is about 20 grains.

From what is Scammony obtained? It is the inspissated juice of the Convolvulus Scammonia, growing in Siberia and Asia Minor. There are two varieties in commerce, the Aleppo and Smyrna Scammony.

What are the medical properties and uses of scammony?

It is an energetic cathartic, apt to occasion griping, and may be used in cases where a powerful impression is desired. It is seldom given alone. Dose 5 to 10 grains.

What are the properties and uses of the root of the Helleborus niger or Black Hellebore? It is a drastic hydragogue cathartic with emmenagogue powers; the fresh root applied to the skin will inflame and vesicate. Dose 10 to 20 grains. It is seldom given alone.

What is Colocynth procured from? It is the fruit of the Cucumus Colocynthus deprived of its rind. It is an annual plant bearing considerable resemblance to the common cucumber; and is a native of Turkey.

What are its medical properties and uses? The pulp is a powerful, drastic, hydragogue cathartic, producing all the effects of cathartics of this class. The dose is 5 to 10 grains. The active principle is *colocynthin*. It is seldom given alone. The most common form of its exhibition is the compound extract, which is officinal. Dose 10 to 15 grains.

What is Gamboge? It is the inspissated juice of a tree supposed to be Stalagmatis Cambogioides or Garcinea Cambogia, natives of Asia.

What are its properties and uses? It is a powerful, drastic, hydragogue cathartic; apt to nauseate, and vomit, and used in cases where such properties are indicated. Dose 3 to 6 grains in pill or emulsion. It is a constituent in the compound cathartic pill, the dose of which is 3 pills

What is Elaterium produced from? The Momordica Elaterium or squirting cucumber, a native of Europe. The fruit has the shape of a small oval cucumber, about 1½ inches long, covered with stiff hair, or prickles. The elaterium is the substance spontaneously deposited by the juice of the fruit, resides in that part which surrounds the seeds, and may be obtained without expression.

What are its properties and uses? It is a powerful hydragogue cathartic, and in large doses will excite vomiting.

The dose of ordinary commercial elaterium is from 1 to 2 grains given in ¼ grain portions, repeated every half hour, or hour until it operates. Of the purest 1-8 of a grain is a dose. The active principle is *elaterin*. Dose 1-16 of a grain.

What is the Croton Oil procured from? It is the oil of the seeds of the Croton Tiglium, a native of the East Indies; obtained by expression of the seeds after having been deprived of their shell.

What are its properties and uses? It is a powerful, hydragogue purgative, producing violent effects if given in an over dose.

Dose 1 or 2 drops, administered in pill with a crumb of bread. Applied externally it inflames the skin, and produces a pustular eruption.

Mineral Cathartics.

What are the properties and uses of Flowers of Sulphur? It is laxative, diaphoretic, and alterative, is evidently absorbed, and passes off by the skin. Dose as a laxative ʒj to ʒij. It is used externally as an ointment, and in vapor.

How is Lac Sulphuris prepared? By boiling sulphur and lime in water, filtering, precipitating by muriatic acid, and washing the precipitate.

What are the properties and uses of the Carbonate of Magnesia? It is antacid, and by combining with acid in the stomach becomes cathartic. Dose ʒss to ʒij.

What are the properties of Calcined Magnesia, or Magnesia usta? It is antacid, and laxative; used very much among children. Dose for an adult ʒj, for a child 2 years old from 10 to 20 grains.

Saline Cathartics.

What is the general character of saline cathartics? They are intermediate in power between laxatives, and purges, produce watery evacuations; operate as arterial sedatives, and do not act harshly. These properties adapt them to inflammatory and active febrile complaints. They closely resemble each other in properties.

What are their doses? Sulphate of Soda or Glauber's salt; of the crystalized salt ʒj to ʒij; effloresced, half the quantity.

Sulphate of Magnesia or Epsom salts; dose ʒj to ʒjss.

Sulphate of Potassa; dose ʒss to ʒjss.

Supertartrate of Potassa, called also cream of tartar; dose ʒss to ʒj. It is frequently combined with jalap as a hydragogue.

Tartrate of Potassa or soluble tartar. Dose ʒss to ʒj.

Tartrate of Potassa and Soda or Rochelle salt. Dose ʒj to ʒjss. It enters into the composition of the Seidlitz Powders, which are tartrate of potassa and soda ʒij, and bi-carbonate of soda ℈ij in a white paper; and tartaric acid grs. xxxv in a blue paper.

Phosphate of Soda. Dose ℥j to ℥ij.

What is the officinal name of Calomel? Mild Chloride of Mercury—Hydrargyrum Chloridum Mite, sometimes improperly called Submuriate of Mercury.

What are the tests of purity? It sublimes freely on the application of heat, and strikes a black color free from reddish tinge, by the action of fixed alkalies. The presence of corrosive sublimate may be tested by ammonia.

What are its incompatibles? The alkalies, alkaline earths and their carbonates, hydrosulphates, &c.

Howard's calomel is prepared by bringing steam in contact with it while in a state of vapor, which converts it into an impalpable powder, and washes it from corrosive sublimate.

What are the medical properties and uses of calomel? In addition to the general properties of mercurials, it unites those of a purgative, and anthelmintic.

It is employed to a great extent, and is the most valuable of the mercurial preparations.

As a cathartic its tendency to increase the secretory functions of the liver is its chief value.

As an alterative the dose is ½ a gr. every other night, or every night, keeping the bowels at the same time gently open; to produce salivation the dose is ½ to 1 gr. 3 or 4 times a day increased if necessary; if it purges it should be combined with opium; as a purgative the dose is 5 to 15 or 20 grs. Larger doses are required in proportion for children than adults.

Calomel is frequently combined with other purgatives.

Diuretics.

What are Diuretics? They are medicines which increase the secretion of urine.

How do they operate? In one or more of three ways:—by entering the circulation; by a sympathetic impression; or by promoting absorption.

From what is the Squill obtained? It is the bulb of the Scilla maratima, growing on the borders of the Mediterranean. Its active principle is called *scillitin.*

What are its medical properties and uses? It is diuretic, expectorant, and in large doses emetic, and purgative. As a diuretic it is generally combined with calomel, and used when there is not much inflammatory action existing. Dose

as a diuretic, or expectorant 1 to 2 grains repeated 2 or 3 times a day, and increased in quantity until its action is evinced. As an emetic from 6 to 12 grains.

What are the properties and uses of the bulb and seeds of the Colchicum autumnale or Meadow Saffron? They produce sedative effects upon the nervous system as well as stimulate the secretions. Given in sufficient doses they produce disorder of the stomach and bowels, vomiting and purging severely. When not carried off by the bowels, diuresis and diaphoresis are produced. They are used in rheumatism, and gout. Dose of the bulb, or seeds, from 2 to 8 grains; but it is usually administered in the form of wine.

There are two officinal vinous tinctures.

The Vinum Colchici Radicis, the dose of which is from 10 drops to f℥j.

The Vinum Colchici Seminis. Dose f℥ss to f℥j.

What are the properties and uses of the root of the Apocynum Cannabinum or Indian Hemp? It is diuretic, powerfully emetic, and cathartic.

Used in decoction, made with ℥ss to Ojss of water, and boiled to Oj; dose of which is f℥j to f℥ij 2 or 3 times a day.

What are the properties and uses of the Leontodon Taraxicum or Dandelion? It is slightly diuretic, tonic, and aperient; and is thought to have a specific action on the liver. Its properties adapt it to diseases of the digestive organs, and dropsical affections depending upon them. An irritable condition of the stomach, and bowels, and acute inflammation contra-indicate its use. Dose of the officinal decoction f℥ij 2 or 3 times a day; of the extract 20 or 30 grs.

What are the properties and uses of the fruit of the Juniperus communis or Juniper berries? The active ingredient is a volatile oil.

The berries are stimulant, and diuretic, and in large doses produce irritation of the urinary passages; they are generally used as an adjuvant to more powerful diuretics. It is a native of Europe. Dose of the infusion, (℥j to Oj) one pint during the day, often combined with cream of tartar. Dose of the oil 5 to 15 drops.

What are the properties and uses of the seeds of the Daucus Carota or Wild Carrot? They are gently stimulant, and diuretic, and may be used in nephritic affections where the stomach is enfeebled. The active ingredient is a volatile oil. Dose ℥ss to ℥j of the bruised seeds, or one pint of the infusion, made with ℥jss to Oj of water, in the 24 hours.

What are the properties and uses of the root of the Apium Petroselinum or Parsley? It is diuretic, and aperient; used in stranguary. Dose of the infusion indefinite.

From what is turpentine obtained? It is the juice of different species of the genera Pinus, Abies, and Larix, and consists of a resin, and volatile oil.

There are two kinds used in the United States. The common white turpentine, derived principally from the Pinus palustris; and the Canada turpentine, derived from the Abies balsamifera or Balsam of fir. Their virtues reside in the volatile oil.

What are their medical properties and uses? They are stimulant, diuretic, anthelmintic, and laxative. If long continued they produce irritation of the mucous membrane of the urinary organs. Dose 10 grains to ʒj, in pill or emulsion.

The volatile oil or spirit of turpentine is generally used; the dose of which is 10 to 20 drops, and repeated. It is also used externally as a rubefacient.

What is the Balsam of Copaiva derived from? It is the the juice of the Copaifera officinalis, and other species of the Copaifera, growing in Brazil and Guiana.

What are its properties and uses? Its constituents are a resin and a volatile oil? It is gently stimulant, diuretic and laxative.

It is used in gonorrhoea, leucorrhoea, gleet, chronic dysentery, and in chronic bronchitis.

Dose 10 to 30 drops 3 times a day; of the volatile oil 5 to 15 drops.

What are the medical properties and uses of Cantharis vesicatoria, Cantharides, or Spanish Flies? Administered nternally they are powerfully stimulant, and exercise a peculiar influence over the urinary organs. In moderate doses diuretic. Externally applied they inflame and vesicate.—Dose 1 or 2 grains of the powder 2 or 3 time daily; of the tincture 10 drops as often.

What are the doses of the Carbonates of Potassa? The carbonate is used in doses of 10 to 30 grains 3 or 4 times a day.

The bicarbonate is used in doses from ʒss to ʒj.

What are the medical properties and uses of the Acetate of Potassa, or sal diureticus. It is diuretic in doses of from ℈j to ʒj, every 2 or 3 hours. In large doses it is cathartic.

What are the properties of Bitartrate of Potassa, or Cream of Tartar. It is diuretic, cathartic, and refrigerant. In

small doses it is a cooling aperient; in large ones it is a hydragogue cathartic, which renders it useful in dropsies, as well as on account of its diuretic properties.

The dose is from ℥j to ℥ij as an aperient; and from ℥ss to ℥j as a hydragogue cathartic.

What are the medical properties and uses of the Nitrate of Potassa or Saltpetre? It is diuretic, refrigerant, and diaphoretic.

Dose as a diuretic from 10 to 20 grains repeated.

What are the medical properties and uses of Spirit of Nitric Ether, or Sweet Spirit of Nitre? It is diuretic, diaphoretic, and anti-spasmodic.

Dose in febrile diseases as a diaphoretic about one teaspoonful.

When given as a diuretic it should be given in larger doses.

Diaphoretics.

What are Diaphoretics? They are medicines which promote perspiration.

How do they exert a beneficial effect in disease? By removing constriction of the cutaneous capillaries; by depleting from the blood vessels; by revulsion to the surface; by promoting absorption, and by eleminating noxious matter from the blood.

What circumstances should a patient be subjected to if free perspiration be required? He should be confined bed, well covered, clothed with flannel next the skin, and warm diluent drinks freely given. If there is high inflammatory excitement the lancet or other depleting remedies should be premised.

How are diaphoretics divided? Into nauseating, refrig ant, and alterative diaphoretics.

Nauseating Diaphoretics.

What are some of the nauseating diaphoretics. cacuanha, and Tartrate of Antimony and Potassa.

With what is ipecacuanha usually combined? With opium in the form of Dover's Powders, which consists of ipecacuanha 1 grain, opium 1 grain, and sulphate of potassa 8 grains. Dose 10 grains repeated every 4 or 6 hours.

What is the dose of tartar emetic as a diaphoretic? From 1-12 to ¼ of a grain.

Refrigerant Diaphoretics.

What are some of the refrigerant diaphoretics? Citrate of Potassa, Acetate of Ammonia, Nitrate of Potassa, and Spirit of Nitric Ether.

How is the Citrate of Potassa used? In two forms; the neutral mixture or saline draught and the effervescing draught. Dose of the former fʒss every hour or two. Of the latter fʒss of the alkaline solution with fʒss of the lemon juice or the acid solution.

They are sometimes combined with tartar emetic; and also with spirits of nitre.

How is the Acetate of Ammonia used? In the form of the officinal solution called liquor ammonia acetatis, or spiritus Mindereri. Dose fʒss to fʒj repeated every 2 or 3 hours.

How is Nitrate of Potassa used? It is usually combined with tartar emetic, 1-6 gr. to 10 or 15 grains of the nitrate.

How is the Spirit of Nitre used? It is used in fevers where there is nervous derangements, or a typhoid tendency and in children.

Dose 20 drops to fʒj repeated.

Alterative Diaphoretics.

What are some of the alterative diaphoretics? The products of the Guaiacum officinale, Mezereon, Sassafras, and Sarsaparilla

What are the products of the Guaiacum officinale. The Guaiacum wood, and the Guaiac a concrete juice. The medicinal properties of the wood are owing to the guaiac which it contains. It grows in the West Indies and South America.

What are the properties and use of guaiac. It is stimulant, alterative, and promotes the secretions particularly of the skin. Dose of powder 10 to 30 grains with sweetened water or mucilage. There are two officinal tinctures. Dose of either fʒj. The wood is used in decoction, and is an ingredient in the compound decoction of sarsaparilla.

From what is Mezereon obtained? It is the bark of the root of different species of Daphne; a native of Europe.

What are its properties and uses? The recent bark applied to the skin inflames and vesicates. Given internally

it is stimulant, which may be directed to the skin or kidneys. Dose of the bark in substance 10 grains. Generally given in decoction with licorice root, which is officinal. Dose a tea cup-full four times a day.

What are the officinal portions of the Laurus Sassafras? The bark of the root, (Sassafras Radicis Cortex) and the pith of the twigs (Sassafras Medulla).

What are the medical properties and uses of the bark? It is stimulant, and diaphoretic. Its active principle is a volatile oil, dose from 2 to 10 drops. The infusion may be given ad libitum.

What are the properties and uses of Sarsaparilla? It is the root of different species of the smilax growing in Mexico, West Indies, and South America. Its active principle is *sarsaparillin*. It acts upon the secretions, and thereby produces alterative effects. There are numerous officinal preparations. Dose of the powder ʒss. ʒj.; of the compound decoction fʒ iv.—of the syrup ʒss;—of the alcoholic extract 10 to 20 grains; of the fluid extract fʒj.

Expectorants.

What are Expectorants? They are medicines which increase the secretion from the mucous membrane of the air cells, and air passages of the lungs; or facilitate its discharge.

What circumstances should a patient be subjected to while using expectorants? The surface should be kept warm, and flannel worn next to the skin.

Are emetic substances usually expectorant in small doses? Yes, ipecacuanha in doses of 1 to 2 grains; a tartar emetic in doses of ½ of a grain; and their preparations also in this proportion.

What are the properties and uses of Squill as an expectorant? It stimulates the vessels of the lungs; and where there is much inflammation it should be preceded by bloodletting. The officinal preparations are the vinegar, syrup, oxymel, and tincture.

Dose of vinegar fʒss. to fʒj, of syrup and oxymel from fʒj to fʒij. of tincture from 20 to 40 drops.

What are the properties and uses of the bulb of the Allium Sativum or Garlic? It is a general stimulant and promotes expectoration in debilitated states of the lungs. The expressed juice is often given to children with sugar. Dose fʒss. to ʒj.

What are the properties and uses of the root of the Polygala Senega or Seneka? Its active principle is *senegin*.

It is a stimulating expectorant, and diuretic; it also acts more or less on all the secretions.

Dose of powder from 10 to 20 grains; of decoction made by boiling ʒj of the root with ʒj of liquorice root in Ojss of water to Oj; given in doses of fʒj to fʒjj 3 or 4 times a day. It is an ingredient in Coxe's hive syrup.

What are the properties and uses of the root of the Cimicifuga racemosa or black snake root? It stimulates the secretions and particularly those of the skin, kidneys, and bronchial mucous membrane.

Dose of powder 10 to 30 grains; decoction fʒj to fʒij, repeated frequently.

From what is Ammoniac obtained? It is the inspissated juice of the Dorema Ammoniacum, an umbelliferous plant growing in Persia. It comes in tears and masses.

What are its properties and uses? It is a stimulant, and expectorant gum resin; mostly used in chronic catarrh, asthma, and other pectoral diseases. Dose 10 to 30 grains in emulsion or pill.

What is the character of Assafœtida as an expectorant? It is an efficient expectorant, and moderate stimulant. Dose 5 to 15 or 20 grains, in pill or emulsion.

From what is the Balsam of Tolu obtained? The Myroxolon Toluiferum a tree growing in Tropical America.—Its essential constituents are a resin, volatile oil, and benzoic acid. It is procured by incising the trunk of the tree, and collecting the juice.

What are its medical properties and uses? It is a gently stimulating expectorant.

Dose 10 to 30 grains in emulsion; of the tincture fʒj to fʒij.

What are the properties and uses of the balsam of the Myroxylon Peruiferum, or Peruvian balsam? Its constituents are a resin, volatile oil, and benzoic acid. It is a warm, stimulating tonic, and expectorant. Dose fʒss.

Emmenagogues.

What are Emmenagogues? They are medicines which promote the menstrual secretion.

How do emmenagogues act? They may act either through the medium of the circulation; or by an impression being made elsewhere, and extended sympathetically to the uterine vessels.

How should they be given so as to produce their full effect? A short time before the regular period of menstruation. The state of the system should be carefully considered; if the system is plethoric they should be preceded by depletion, and the milder ones of the class should be used. If debility exist those of a tonic or stimulant character should be used; and if constipation attend, the cathartic emmenagogues are indicated.

What are the properties of the calybeates as regards their emmenagogue power? They are considered to be inferior to no other remedies in this respect, and are applicable where there is no local inflammation or general excitement. They are often combined with aloes.

What are the properties of Aloes as an emmenagogue? It is very effective, and believed to exert a specific influence on the uterine vessels independent of its cathartic property. Dose 1 or 2 grains 2 or 3 times a day. It may also be given in enema about the period when menstruation should come on.

What is the dose of Black Hellebore as an emmenagogue? From f℥ss to f℥i of the tincture, 2 or 3 times a day.

What are the properties of Guaiac as an emmenagogue? It is applicable in cases associated with rheumatism, particularly in its neuralgic forms. Used in dysmenorrhoea either in the simple or ammoniated tincture. Dose f℥j 3 or 4 times a day.

What are the properties of the leaves of the Juniperus Sabina or Savine? They are highly stimulant, increase most of the secretions, and particularly those of the uterus.

The active principle is a volatile oil called *oil of Savine.* It should be avoided in pregnancy. Dose of the powder from 5 to 20 grains, 2 or 3 times a day; of the oil from 2 to 5 drops. The plant is a native of Europe.

What are the properties of Cantharides as an emmenagogue? They exert a powerful stimulant effect over the urinary and genital organs.

Dose of the tincture 10 to 30 drops three times a day.

Epispastics.

What are Epispastics? Medicines that produce a blister when applied to the skin. They are called also vesicatories.

How do they exert a remedial influence? By acting indirectly as general stimulants; by their revulsive action; by

substituting their own action for a diseased one in the part to which they are applied; by their local stimulus; by producing local depletion; by the pain they occasion which may be useful in hypochrondrical cases; and they are employed to separate the cuticle for the purpose of applying medicines.

What are the officinal preparations of the Cantharis vesicatoria or Spanish Fly as an epispastic? The Cerate of Spanish flies commonly called blistering plaster. Used for blistering.

The Ointment used for maintaining a discharge.

The Plaster of Pitch with Spanish flies. Used as a rubefacient plaster.

The Linament of Spanish flies generally called decoction of flies in oil of turpentine. Used as an external stimulant.

What are the remedies for stranguary produced by cantharides? The milder diuretics such as uva ursi, sweet spirit of nitre, mucilages, &c.

Where are they procured? In Spain and Italy. Active principle *cantharadin*.

What are the properties of the indigenous insect the Cantharis Vittata or Pottato fly? They are similar to the Spanish flies; the chemical composition and uses the same.

Rubefacients.

What are Rubefacients? They are medicines which inflame the skin, and producing redness without ordinarily vesicating.

What are the indications for the use of this class in preference to blisters? In cases where a sudden and powerful action is necessary; and in cases where a slight but long continued action is desired; in which case the milder articles should be employed.

Will you enumerate the rubefacients commonly employed? The seeds of the Sinapis alba and S. nigra, distinguished as white and black mustard; Cayenne Pepper; Oil of Turpentine; Burgundy Pitch which is the product of the Abies Communis, growing in the north of Europe; Hemlock Pitch or Pix Canadensis, very analagous to the Burgundy pitch; and Aqua Ammonia which is much used in combination with sweet oil as volatile liniment.

Escharotics.

What are Escharotics? They are substances which destroy the life of the part to which they are applied, and produce sloughing. They operate by chemical agency, or by influencing the vitality of the part directly.

What substances are used for this purpose? The Actual cautery; Moxa; Potassa or common caustic; Nitrate of Silver; or Lunar caustic; Arsenious acid or the white oxide; Sulphate of Copper; Bichloride of Mercury or Corrosive sublimate; Burnt Alum, and the Mineral acids.

Demulcents.

What are Demulcents? They are bland substances which form a viscid solution with water.

What medicines are used as demulcents? Gum Arabic, the product of several species of the Acacia. Tragacanth. Slippery Elm bark or the inner bark of the Ulmus fulva. Flax seed or the seeds of the Linum usitatissimum.

Licorice root or the root of the Glycyrrhiza glabra. Iceland moss or Lichen Islandicus. Irish moss or Carrageen. Sago, the product of the Sagus Rumphii. Tapioca, the product of the Jatropa Manihot of Tropical America. Arrow root, the product of the Maranta arundinacea of the West Indies. And the Barley, called commonly pearl barley or hordeum perlatum.

Emollients.

What are Emollients? They are substances which retain moisture, and form a soft mass without irritating properties.

Diluents.

What are Diluents? They are liquids which dilute the contents of the stomach, and bowels, fill the bloodvessels, and increase and dilute the secretions. Water is the great diluent, to which additions are made to give it flavor.

Medicines Unclassified.

From what is Ergot obtained? It is a product of the Secale cereale or common rye.

What are its properties and uses? It yields its virtues to water, and alcohol. Its active principle is *ergotin*. It exhi-

bits a strong tendency to the uterus, and operates with energy upon its contractile property; and reduces the frequency of the pulse. Bread made from rye contaminated with it, and long used will produce dry gangrene, typhus fever, diseases of the nervous system, &c.

It is adapted to lingering cases of labor where the os uteri is dilated, the external parts relaxed, and no mechanical impediment exists; the delay being ascribable solely to a want of energy in the uterus.

Dose of the powder 10 to 20 grains; of the infusion ʒj, made with ʒj of the ergot to fʒiv of water, to be repeated every 20 minutes until its peculiar effects are produced.

From what is the Nux Vomica obtained? It is the seed of the Strychnos Nux Vomica, a tree growing in the East Indies. The active ingredients are *strychnia* and *brucia*.

What are its properties and uses? In very small doses it is tonic, and operates upon the secretions. In larger doses so as to produce a decided effect, its action is chiefly directed to the nerves of motion producing a tendency to permanent, involuntary, muscular contraction. It is sometimes used in paralytic affections, and its action appears to be particularly directed to the parts affected. Dose of the powder 5 grains; of the alcoholic extract from 1-2 to 2 grains; of strychnia from 1-12 to 1-6 of a grain.

What are the properties and uses of Arsenious acid? Internally it is alterative, febrifuge, and peculiarly applicable in diseases of a periodical character. The effects should be carefully noted, and when there is any disposition to edæma produced, especially of the face, and eyelids, or a feeling of stiffness, tenderness of the mouth, &c., it should be discontinued immediately. It has been used in scirrhus, anomalous ulcers, intermittent fever, diseases of the bones, and in cutaneous diseases. It is an ingredient in nearly all empirical, external remedies for cancer.

Dose 1-12 of a gr. in pill, and taken 3 times a day. Of the Fowler's solution 10 drops 2 or 3 times a day.

What are the preparations of Mercury that are used medicinally, and their doses as alteratives, or sialagogues? Mercurial ointment or Unguentum Hydrargyri; Mercurial Plaster or Emplastrum Hydrargyri—Mercurial Pills or Pilulæ Hydrargyri commonly called blue pills. Dose 1 pill 3 times a day as a sialagogue; 1 every night or every other night as alterative. The officinal pill weighs 3 grains, and

contains 1 gr. of mercury: Mercury with chalk or Hydrargyrum cum Creta, dose 5 to 20 grains twice daily.

Black oxide of mercury or Hydrargyri Oxidum Nigrum—dose 1 to 3 grains 2 or 3 times a day—Red oxide of mercury or Hydrargyri Oxidum Rubrum, commonly called red precipitate; used externally as an escharotic, and stimulant—the officinal ointment called Unguentum Hydrargyri Oxidi Rubri—Mild chloride of mercury or Hydrargyri Chloridum mite commonly called Calomel; dose from 1-2 a gr. to 1 grain 3 times daily—Corrosive chloride of mercury or Hydrargyri Chloridum Corrosivum commonly called corrosive sublimate; dose from 1-8 to 1-4 of a grain 3 or 4 times a day—Yellow sulphate of mercury or Hydrargyri Sulphas Flavus, commonly called Turpeth mineral, dose as an alterative from 1-2 grain to 1 grain, and from 2 to 5 grs. as an emetic; seldom used; sometimes as an errhine, diluted with 5 parts of starch—Ammoniated mercury or Hydrargyrum Ammoniatum, commonly called white precipitate; used externally Nitrate of mercury, used only as an ointment, called the ointment of nitrate of mercury or Unguentum Hydrargyrum Nitratis commonly called citrine ointment—Red Sulphuret of mercury, or Hydrargyri Sulphuretum Rubrum commonly called cinnabar, used only for fumigation—Black sulphuret of mercury or Hydrargyri Sulphuretum Nigrum, formerly called Ethiops mineral, scarcely ever used at present.

What are the properties and uses of Iodine? It operates as a general excitant, but particularly of the glandular, and absorbent systems.

If long continued or given in very large doses it gives rise to derangement of the nervous system, restlessness, palpitation, a sense of burning along the gullet, excessive thirst, acute pain in the stomach, violent cramps, rapid and great emaciation, and frequent pulse. The condition of the system in which any of these poisonous effects are exhibited are called *iodism*. It is used in glandular enlargements and morbid growths. Dose ¼ to ½ of a grain 3 times a day. It is never used in powder but dissolved in alcohol or a watery solution of the iodide of potassium. Dose of the officinal tincture 10 to 20 drops.

The Iodide of Potassium is officinal. Dose 1 to 2 grains; Lugols solution is iodine ℈j, iodide of potassium ℈ij and water ℥vii. Dose 6 drops repeated. Iodine ointment, ℥j of lard and ℈j of iodine.

Antacides.

What are Antacids? Substances capable of combining with and neutralizing acids.

What substances are used as antacids? The carbonates of potassa and soda, ammonia, lime, and magnesia.

Anthelmintics.

What are Anthelmintics? Substances which operate on worms in the alimentary canal, and render them easy of expulsion.

From what is Pink root obtained? It is the root of the Spigelia Marylandica, and is the only part of the plant which is officinal.

What are its properties and uses? It is considered to be one of the most powerful of the anthelmintics. In over doses it determines to the brain giving rise to vertigo, dimness of vision, spasms, &c. Dose of the powder for a child from 2 to 4 years old, 10 to 20 grains, repeated twice a day, and followed by a cathartic; sometimes it is combined with calomel. Dose of the infusion for a child fʒss to fʒj, 3 or 4 times a day, made with ʒss of the root to Oj. of water; often given with ʒss of senna added, in the same dose.

What are the properties of the bark of the root of the Melia Azedarach, or Pride of China? Used in decoction made by boiling Oji of water with ʒiv of the fresh root to Oj. Dose for a child ʒss every 2 or 3 hours, and followed by a cathartic.

From what is Worm seed obtained? They are the seeds of the Chenepodium anthelminticum.

What is the dose? In substance bruised ℈j to ℈ij for a child; of the volatile oil from 4 to 8 drops for a child, repeated twice a day.

What are the properties and uses of Cowhage? The spiculae are vermifuge, and act mechanically on the worm. Dose of the electuary for an adult ʒss; for a child 3 or 4 years old ʒj.

What is the dose of the oil of turpentine as an anthelmintic? For an adult from fʒss to fʒij or even more followed with castor oil. Dose for children in proportion.

What is the dose of Stannum or Tin as an anthelmintic? From ʒj to ʒj.

TABLE OF SIGNS AND ABBREVIATIONS.

℞	Recipe.	Take.
āā	Ana.	Of each.
℔	Libra vel libræ.	A pound or pounds.
℥	Uncia vel unciæ.	An ounce or ounces.
ʒ	Drachma vel drachmæ.	A drachm or drachms.
℈	Scrupulus vel scrupuli.	A scruple or scruples.
O	Octarius vel octarii.	A pint or pints.
f℥	Fluiduncia vel fluiduncіæ.	A fluidounce or fluidounces
fʒ	Fluidrachma vel fluidrachmæ.	A fluidrachm or fluid drachms.
♏	Minimum vel minima.	A minim or minims.
Chart.	Chartula vel chartulæ.	A small paper or papers.
Coch.	Cochlear vel cochlearia.	A spoonful or spoonfulls.
Collyr.	Collyrium.	An eye-water.
Cong.	Congius vel Congii.	A gallon or gallons.
Decoc.	Decoctum.	A decoction.
Ft.	Fiat.	Make.
Garg.	Gargarysma.	A gargle.
Gr.	Granum vel grana.	A grain or grains.
Gtt.	Gutta vel guttæ.	A drop or drops.
Haust.	Haustus.	A draught.
Infus.	Infusum.	An infusion.
M.	Misce.	Mix.
Mass.	Massa.	A mass.
Mist.	Mistura.	A mixture.
Pil.	Pilula vel pilulæ.	A pill or pills.
Pulv.	Pulvis vel pulveres.	A powder or powders.
Q. S.	Quantum sufficit.	A sufficient quantity.
S.	Signa.	Write.
Ss.	Semis.	A half.

Examples of Common Extemporaneous Prescriptions.

POWDERS.

℞ Antimonii et Potassæ Tartratis gr. i.
Pulveris Ipecacuanhæ ℈i.
Fiat pulvis.
S. To be taken in a wineglassful of sweetened water.
An active emetic.

℞ Hydrargyri Chloridi Mitis,
Pulveris Jalapæ, āā gr. x.
Misce.
S. To be taken in syrup, or molasses.
An excellent cathartic in the commencement of bilious fevers, and in hepatic congestion.

℞ Pulveris Jalapæ gr. x.
Potassæ Bitartratis ʒii.
Misce.
S. To be taken in syrup, or molasses.
A hydragogue cathartic used in dropsy and scrofulous inflammation of the joints.

℞ Sulphuris ʒi.
Potassæ Bitartratis ʒii.
Misce.
S. To be taken in syrup, or molasses.
A laxative, used in piles and cutaneous diseases.

℞ Pulveris Rhei gr. x.
Magnesiæ ʒss.
Fiat pulvis.
S. To be taken in syrup, or molasses.
A laxxative and antacid, used in diarrhœa, dyspepsia, &c.

℞ Pulveris Scillæ gr. xii.
Potassæ Nitratis ʒi
Fiat pulvis, in chartulas sex dividendus.
S. One to be taken twice or three times a day in syrup or molasses.
A diuretic, employed in dropsy.

℞ Potassæ Nitratis ʒi.
Antimonii et Potassæ Tartratis gr. i.
Hydrargyri Chlorid. Mitis gr. vi.
Fiat pulvis, in chartulas sex dividendus.
S. One to be taken every two hours in syrup or molasses.
A refrigerant, diaphoretic, and alterative, used in bilious fevers; usually called *nitrous powders*.

℞ Pulveris Guaiaci Resinæ,
Potassæ Nitratis, āā ʒi.
Pulveris Ipecac. gr. iii.
Opii gr. ii.
Fiat pulvis, in chartulas sex dividendus.
S. One to be taken every three hours in syrup or molasses.
A stimulant diaphoretic, used in rheumatism and gout after sufficient depletion.

Ferri Subcarbonatis.
Pulveris Colombæ,
℞ Pulveris Zingiberis, āa. ʒi

Fiat pulvis, in chartulas sex dividendus.

S. One to be taken three times a day in syrup or molasses.

A tonic, used in dyspepsia and general debility.

PILLS.

℞ Pulveris Aloes,
Pulveris Rhei, āā ʒss.
Saponis ℈i.
Misce, et cum aqua fiat massa in pilulas viginti dividenda.

S. Two or three to be taken daily, at bed-time, or before a meal.

An excellent laxative in habitual costipation.

℞ Massæ Pilularum Hydrargyri,
Pulveris Aloes,
Pulveris Rhei, āā ℈i.
Misce, et cum aqua fiat massa in pilulas viginti dividenda.

S. Three to be taken at bed-time.

An alterative and laxative, useful in constipation with deranged or deficient hepatic secretion.

℞ Pulveris Aloes,
Extracti Quassiæ, āā. ʒi.
Olei Anisi ♏x.
Syrupi, q. s.
Misce, et fiat massa in pilulas triginta dividenda.

S. Two to be taken once, twice, or three times a day.

A laxative, tonic, and carminative, useful in dyspepsia.

℞ Pulv. Rhei.
Sapo Alba.
Myrrhae.
Assafaetida ʒss āā.
Misce, et fiat massa in pilulas triginta dividenda.

S. One or two to be taken after each meal.

Useful in promoting digestion, and relieving pain and uneasiness of the stomach.

℞ Pulveris Scillæ ℈i.
Hydrargyri Chloridi Mitis gr. x.
Pulveris Acaciæ,
Syrupi, āā q. s.
Misce, et fiat massa in pilulas decem dividenda.

S. One to be taken two or three times a day.

A diuretic and alterative, much used in dropsy, especially when complicated with organic visceral disease.

℞ Pulveris Opii gr. iv.
Pulveris Ipecacuanhæ gr. xviii.
Pulveris Acaciæ,
Syrupi, āā q. s.
Misce, et fiat massa in pilulas duodecim dividenda.

S. One to be taken after each stool.

An anodyne diaphoretic, useful in dysentery and diarrhœa after the use of laxatives.

℞ Pulveris Opii,

Pulveris Ipecacuanhæ, āā gr. iii.
Hydrargyri Caloridi Mitis gr. vi.
Pulveris Acaciæ,
Syrupi, āā q. s.
Misce, et fiat massa in pilulas tres dividenda.

S. One or more to be taken at bed-time, or according to circumstances.

An anodyne, diaphoretic, and alterative, very useful in diarrhœa, dysentery, typhoid pneumonia and various other diseases.

℞ Plumbi Acetatis in pulverem triti gr. xii.
Pulveris Opii gr. i.
Pulv. Acaciæ,
Syrupi, āā q. s. ut fiat massa in pilulas sex dividenda.

S. One every two, three, or four hours.

An astringent much employed in hæmoptysis and uterine hemorrhage

MIXTURES.

℞ Magnesiæ ʒi.
Syrupi fʒi.
Tere simul, et affunde
Aquæ Acidi Carbonici fʒiv.
Fiat haustus.

S. To be taken at a draught, the mixtute being well shaken.

An agreeable mode of administering magnesia.

℞ Mannæ ʒi.
Fœniculi contusi ʒi.
Aquæ bullientis fʒiv.
Fiat infusum et cola; dein adjice
Magnesiæ Carbonatis ʒii.
Ft. Mist.

S. One third to be taken every three or four hours till it operates, the mixture being shaken.

An excellent carminative and mild laxative in flatulence and pain in the bowels.

℞ Olei Ricini fʒi.
Pulveris Acaciæ,
Sacchari, āā ʒii.
Aquæ Menthae Piperitæ fʒiii.
Acaciam et saccharum cum fluiduncia dimidia aquæ menthæ tere; dein oleum adjice, et contere; denique aquam reliquam paulatim infunde, et omnia misce.

S. To be taken at a draught, the mixture being well shaken.

R Olei Ricini fʒi.
Vitellum ovi unius.
Tere simul, et adde
Syrupi fʒss.
Aquæ Menthæ Pipertæ fʒii
Ft. haust.

S. To be taken at a draught, the mixture being well shaken.

This and the preceding formula afford convenient modes of administering castor oil, when the stomach is irritable. Any other fixed oil may

be given in the same way.

℞ Olei Ricini f℥iss.
Tincturæ Opii ℥xxx.
Pulv. Acaciæ,
Sacchari, āā ℥ii.
Aquæ Menthæ Viridis f℥iv
Acaciam et saccharum cum paululo aquæ menthæ tere; dein oleum adjice, et iterum tere; denique aquam reliquam paulatim infunde, et omnia misce.

S. A tablespoonful to be taken every hour or two hours till it operates, the mixture being each time well shaken.

Used as a gentle laxative in dysentery and diarrhœa. It is usually known by the name of *oleaginous mixture.*

℞ Elaterii gr. i.
Spiritus Ætheris Nitrici f℥ii.
Tincturæ Scillæ,
Oxymellis Colchici, āāf℥ss
Syrupi, f℥i.
Ft. mist.

S. A teaspoonful to be taken three or four times a day in a little water.

Diuretic, used in Ferriar dropsy.

℞ Copaibæ,
Spiritus Lavandulæ Comp. āā f℥ii.
Mucilaginis Acaciæ f℥ss.
Syrupi f℥iii.
Simul tere; dein paulatim affundo.
Aquæ f℥iv.
Misce.

S A tablespoonful to be taken four times a day or more frequently.

Given in chronic catarrhs, and chronic nephritic affections. The dose must be larger in gonorrhœ.

Neutral Mixture.

℞ Acidi Citrici ℥ii.
Olei Limonis ℥ℓi.
Simul tere et adde
Aquæ f℥iv.
Liqua, et adde
Potassæ Carbonatis q. s. ad saturand.
Misce et per linteum cola.

Or

℞ Succi Limonis recentis f℥iv.
Potassæ Carbonatis q. s. ad saturandum.
Misce et cola.

S. A tablespoonful to be given with an equal quantity of water every hour or two hours.

An excellent diaphoretic in fever.

Effervescing Draught.

℞ Potassæ Carbonatis ℥ii.
Aqæ f℥iv.
Liqua.

Or

℞ Potassæ Bicarbonatis ℥iii.
Aquæ f℥iv.
Aquæ f℥iv.
Liqua.

S. Add a tablespoonful of the solution to the same quantity of lemon or lime juice, previously

mixed with a tablespoonful of water; and give the mixture, in a state of effervescence, every hour or two hours.

An excellent diaphoretic and anti-emetic in fever with nausea or vomiting.

Brown Mixture.

℞ Pulv. Extract. Glycyrrhizæ.
Pulv. Acaciæ ʒii.
Aquæ ferventis fʒiv.
Liqua, et adde
Vini antimonii fʒii.
Tincturæ Opii ℥xx.
Ft. Mist.

S. A tablespoonful to be taken occasionally.

Expectorant, demulcent, and anodyne, useful in catarrhal affections.

℞ Antimonii et Potassæ Tartratis gr. æ,
Syrupi Scillæ,
Liquoris Morphiæ Sulphatis, āā fʒss.
Pulveris Acaciæ ʒii.
Syrupi fʒss.
Aquæ fluvialis fʒiv.
Ft. Mist.

S. A tablespoonful to be taken occasionally.

An expectorant and anodyne cough mixture.

R Acidi Nitrosi fʒi.
Tincturæ Opii gtt. xl.
Aquæ Camphoræ fʒviii.
Misce.

S. One-fourth to be taken every three or four hours.

Hope's mixture, used in dysentery, diarrhœa, and cholera.

R Camphoræ ʒi.
Myrrhæ ʒss.
Pulv. Acaciæ,
Sacchari, āā ʒii.
Aquæ fʒvi.
Camphoram cum alcoholis paululo in pulverem tere; dein cum myrrha, acacia, et saccharo contere; denique cum aqua paulatim instillata misce.

S. A tablespoonful to be taken for a dose, the mixture being well shaken.

A convenient form for administering camphor.

℞ Cretæ preparata ℈iv.
Massæ Pil. Hydrarg. gr. viii.
Tincturæ Opii. gtt. viii.
Pulveris Acaciæ,
Sacchari, āā ʒi.
Aquæ Cinnamomi,
Aquæ, āā fʒ.
Solida simul tere, dein liquida paulatim inter terendum adjice, et omnia misce.

A teaspoonful to be taken for a dose, the mixture being well shaken.

An antacid and alterative mixture, well adapted to infantile diarrhœa with white stools. The dose mentioned is for a child a year or two old, and may be repeated four or six times in twenty-four hours.

℞ Pulveris Kino ʒii.
Aquæ bullientis fʒvi.

Fiat infusum et cola; deinde secundum artem admisce.
Cretæ præparatæ ʒiii.
Tincturæ Opii fʒss.
Spiritus Lavandulæ compositi fʒss.
Pulveris Acaciæ,
Sacchari, āā ʒii.
S. A tablespoonful to be taken for a dose, the mixture being well shaken.
Astringent and antacid, useful in diarrhœa.

Solutions.

℞ Magnesiæ Sulphatis oz. i.
Syrupi Limonis fʒi.
Aquæ Acidi Carbonici fʒvi.
Misce.
S. To be taken at a draught.
An agreeable mode of administering sulphate of magnesia.

℞ Potassæ Nitratis ʒi.
Antimonii et Potassæ Tartratis gr. i.
Aquæ fluvialis fʒiv.
Liqua.
S. A tablespoonful to be taken every two hours.
A refrigerant diaphoretic, used in fevers.

℞ Magnesia Sulphatis ozi.
Antimonii et Potassæ Tartratis gr. i.
Succi Limonis recentis fʒi.
Aquæ fʒiii.
Misce.
S. A tablespoonful to be taken every two hours till it operates upon the bowels.
Useful in fevers.

℞ Quiniæ Sulphatis gr. xii.
Acidi Sulphurici Aromatici ℥xx.
Syrupi fʒss.
Aquæ Menthæ Piperitæ fʒi.
Misce.
S. A teaspoonful to be taken every hour or two hours.
A good mode of administering sulphate of quinia in solution.

Infusions.

℞ Sennæ ʒiii.
Magnesia Sulphatis,
Mannæ, āā ʒss.
Fœniculi ʒi.
Aquæ bullientis Oss.
Macera per horam in vase leviter clauso et cola.
S. Give a teacupful every three or four hours till it operates.
An excellent purgative in febrile complaints.

℞ Colombæ contusæ,
Zingiberis contusi, āā ʒss.
Sennæ ʒii.
Aquæ bullientis Oi.
Macera per horam in vase leviter clauso et cola.
S. A wineglassful to be taken morning, noon and evening, or less frequently if it operate too much.
An excellent remedy in dyspepsia with constipation and flatulence.

℞ Spigeliae ʒss.
Sennae ʒii.

Mannae oz. i.
Fœniculi ʒii.
Aquae bullientis Oi.
Macera per horam in vase leviter clauso et cola.
S. A wineglassful to be given to a child from two to four years old, three or four times a day.
A powerful anthelmintic.
R Pulveris Cinchonæ Rubræ oz. i.

Acidi Sulphurici Aromatici fʒi.
Aquæ Oi.
Macera per horas duodecim, subinde agitans.
S. A wineglassful of the clear liquid to be taken for a dose.
A good method of administering Peruvian bark in cold infusion.

APOTHECARIES' WEIGHT. *U. S.*, *Lond.*, *Ed.*, *Dub.*

Pound.		Ounces.		Drachms.		Scruples.		grains.
℔ 1	=	12	=	96	=	288	=	5760
		℥ 1	=	8	=	24	=	480
				ʒ 1	=	3	=	60
						℈ 1	=	gr. 20

APOTHECARIES' OR WINE MEASURE. *U. S.*, *Dub.*

Gall.		Pints.		Fluidounc's.		Fluidr'ms.		Minims.		Cubic In.
Cong 1	=	8	=	128	=	1024	=	61440	=	231
		O 1	=	16	=	128	=	7680	=	28·875
				f℥ 1	=	8	=	480	=	1·8047
						fʒ 1	=	♏ 60	=	·2256

PART IV.—SURGERY.

Inflammation.

What are the symptoms of inflammation? Unusual redness, heat, swelling and pain.

How has inflammation been divided? Into acute, chronic, healthy, and unhealthy.

How many stages are there of inflammation? Two; the cold and the hot. In the first there is coldness, languor, nausea, and a small quick pulse. In the second the skin is hot, pulse full and hard, there is thirst, and the part becomes swelled and painful. It is not however always accompanied by constitutional symptoms.

What are the terminations of inflammation? There are eight, resolution, adhesion, effusion, suppuration, ulceration, granulation, cicatrization, and mortification, which constitute a series of stages.

What are the causes of inflammation? They are chemical, and mechanical. Among the former are excessive heat, cold, cold and moisture combined, atmospheric air, noxious gasses, acids, alkalies, blisters, rubefacients, animal poisons, contagious, and specific diseases. Among the latter are contusions, lacerations, punctures, fractures, luxatious, pressure, and numerous other agents.

Is every part of the body subject to inflammation? Yes; but in an unequal degree; the liability is generally in proportion to the sensibility of the part.

How are the means of arresting inflammation divided? Into constitutional and local. Among the former are blood-letting, purgatives, diaphoretics, and low diet; among the latter are topical blood-letting, blistering, cold, acetate of lead, tincture of iodine, nitrate of silver, rest, and position-

Suppurative Inflammation.

What are the symptoms of suppuration? The redness assumes a brighter hue, the swelling increases, becomes pointed, and softer, pain is increased, and there is a sensation of pulsation, and throbbing. Rigors or shivering often occurs, and are looked upon as a sure indication that pus is formed, or about to be.

When the pus is once formed pain and redness diminish, the swelling fluctuates, and a cavity exists which encloses the matter.

What are the characteristics of healthy pus? It is of a light yellow or cream color; made up of small globules which float in a watery fluid.

Unhealthy pus is called ichor when it is thin and acrid. Sanies, when it is a fœtid ichor mixed with blood. Sordes when it is of a leaden color, thick, and offensive. Malignant, when generated in pestilential diseases. Contagious, when it has the power of producing a disease of the same character.

What is the treatment of suppurative inflammation? If the patient has been much enfeebled by evacuations, we substitute a better regimen, employ tonics, mineral acids, and opium. As local means we use fomentations, and warm poultices. Poultices should be continued after the discharge of matter unless it is kept up too profusely when other mild dressings should be employed.

What rules should govern us in regard to opening abcesses? Abcesses situated on the face, near large cavities, or joints should be opened early. In other cases they may be left longer. The best instrument for opening them is a narrow sharp pointed bistory; which should be passed in slowly until you find by the feel that it is in the sack, then cut forward so as to make a free incision.

Ulcerative Inflammation.

What is meant by ulcerative inflammation or ulcerative absorption? It is that morbid process by which the continuity of the different textures of the body is destroyed.

What parts of the body are liable to ulceration? Every texture is liable; but the skin and mucous membranes suffer more readily than other parts. Pain always attends this process and it is generally lancinating.

Mortification.

What is mortification? Gangrene is that condition which immediately precedes the destruction of a part. Sphacelus denotes the complete death of a part; and the term mortification designates both stages of the complaint.

What are the different kinds of gangrene? They are the wet and dry; and the idiopathic and traumatic.

The idiopathic is constitutional, and the traumatic results from an injury.

What are the causes of mortification? It is generally the result of inflammation. It may be caused also by poisons, a deficient supply of arterial blood, any cause which will enfeeble the circulation, deposites in the arteries, Ergot, &c.

What are the symptoms? The part loses its sensibility, heat, and color. These changes seldom take place suddenly, but are preceded by an increase of pain, and swelling; the blood circulates only in the larger vessels; the skin become soft and of a dark red or purple color, and vesicles containing a thin serum are formed under the cuticle. When it is complete, if you press upon the part the blood will not return. Along with these symptoms the pulse becomes quick and tremulous, of a typhoid character, tongue dry and brownish, skin hot, the patient restless, uneasy, and frequently with delirium, subsultus, nausea, and hiccup.

What is the treatment? When there is high inflammation which is likely to terminate in gangrene, the antiphlogistic treatment should be adopted; but if gangrene has taken place a different practice must be pursued. The bowels should be gently opened, and tonics, and nutritious food given. Opium, carbonate of ammonia, camphor, &c, will be found beneficial. Local remedies are of use only where the mortification is incomplete; when scarifications, emolient poultices, blisters, &c. have been recommended. In Senile gangrene opium is an important remedy. To prevent sloughing or bed sores, from long confinement, the parts when they are first discolored should be washed with a solution of nitrate of silver 10 gr. to ℥j of water 3 or 4 times a day, then cover with bland adhesive plaster. The hydrostatic bed is highly recommended by Dr. Mussey as a preventative. Where the sores have formed, dress with adhesive plaster, and change the position of the patient.

Amputation is seldom resorted to in cases of mortification

before a line of separation is formed, although it is sometimes, in traumatic gangrene; but it should never be in the idiopathic variety.

What are the symptoms of dry mortification? The toes and feet lose their heat, and become shrivelled, discolored and converted into a hard, dry, insensible mass, of a dark blue or black color, without previous swelling, redness, pain, or fetor.

What is the treatment? Amputation.

Erysipelas.

What are the symptoms of erysipelas? The surface of the part affected is elevated, varies from a bright scarlet to a purplish color, has an abrupt termination, and is accompanied with a burning, or itching sensation. There is generally more or less rigor, fever, nausea, &c. preceding the complaint. The symptoms are sometimes slight, and sometimes very severe, particularly in the epidemic form, and when it attacks the head and face.

What are the causes of erysipelas? The causes are not always obvious; in other cases it may be traced to the application of poisons, wounds, exposure, derangement of the digestive organs, &c.

What is the treatment? In the commencement if indicated by the general symptoms, recourse should be had to blood-letting, purgatives, diaphoretics and low diet. Sometimes a contrary plan becomes necessary during the course of the disease, and opium, bark, camphor, &c., may be indicated. The local remedies in use are tincture of iodine nitrate of silver and acetate of lead in solution, incisions, mercural ointment, British oil, starch, flour, &c. The nitrate of silver applied with a pencil so as to surround the inflammation is frequently resorted to.

Furunculus or Boil.

What are the symptoms of furunculus? It is a hard, painful, and highly inflammed tumor, conical, base below, and apex above the level of the skin; and contains a disorganized mass called a core.

What is the treatment? Encourage suppuration with warm poultices, and as soon as the apex becomes soft make an opening into it large enough to remove the core.

Anthrax or *Carbuncle*

What are the symptons of anthrax? It is a deep seated circumscribed, hard, and painful swelling, of a livid hue, attended with itching and a burning heat, and terminates by sloughing. The constitutional symptons are often very severe, particularly loss of appetite, fever, prostration, &c. When on the scalp they nearly always prove fatal.

What is the treatment? Emmollient poultices in the first stage until vesications, or a discharge of bloody serum appears; it should then be freely covered with caustic vegetable alkali, as recommended by Dr. Physick. Other surgeons recommend that it should be opened early by free incisions, and stimulating applications used. Opium should be freely employed to assuage pain, and procure sleep

Pernio or *Chilblain.*

What are the symptoms of perino? It is the resu of cold, and is met with in the extreme parts of the body. At first the skin is palo and shrivelled, which is succeeded by redness, tumefaction, pain, pruritus, and œdema. In severe cases the skin becomes purplish, the itching very violent, vesication takes place and forms an ill conditioned sore.—The mild form frequently disappears in summer, and returns in the winter.

What is the treatment? The application of soap linament, spirit of turpentine, sulphate of copper, and tincture of cantharides is recommended. The best remedy is to smear the part with the balsam of copaiva.

Frost Bite.

What are the symptoms of frost bite? The exposed part becomes benumed, stiff, and insensible; these symptons are succeeded by heat, swelling, pain, lividity, and suppuration, which occurs between the sound and living parts. When the cold is long continued so as to affect the internal organs, drowsiness, shivering, rigidity of the limbs, diminution of the circulation, and profound sleep, terminating in death.

What is the treatment? Snow and ice water should first be applied, and the parts carefully handled; when the natural temperature is restored it should be treated according to the circumstances of the case in regard to inflammation, tendency to mortification, &c. When the patient is insen-

sible the indications are to restore the respiration, and circulation, by sternutatories, volatiles, frictions, &c.

Burns.

How are burns divided and what are their symptoms?—They are divided into superficial, ulcerated and carbunculous. In the first there is simple erythema; in the second vesication; and the third is where the cutis and adjoining parts are disorganized, with severe constitutional disturbance in proportion to the extent of the injury. In the second variety the constitutional disturbance may be great also, in proportion to the extent of surface involved.

At what periods may burns prove dangerous? When the shock is first received; from reaction or inflammation; and at the suppurative period.

What is the treatment? In superficial burnsthe application of carded cotton is highly extolled; also cooling applications, either by the direct application of cold, or by evaporating lotions. The essence of peppermint before vesication takes place is one of our best application to assauge pain, and prevent the effusion of serum.

In the second variety, emollient applications should be used, and a linament of lime water, and flaxseed oil, or sweet oil spread on cotton batting is as good an application as we can make. In the third variety, the stimulant plan internally and externally should be adopted, until reaction takes place, when the anti-phlogistic system may become necessary. Opium is generally necessary to relieve pain and constitutional disturbance.

The after treatment of the ulcers should be governed by the circumstances of the case, always bearing in mind the strong tendency to contraction of the cicatrices, which should be counteracted by splints, rollers, &c. The treatment of these cicatrices has been recently much improved by means of plastic operations.

Wounds.

How are wounds divided? Into incised, punctured. penetrating, contused, lacerated, poisoned, and gun shot. These may be divided into wounds of the head, face, neck, chest, belly, and extremities.

Incised Wounds.

What are the dangers of incised wounds? These are the least dangerous of the wounds except from hemorrhage, which may be troublesome when a sharp instrument is used or large blood vessels divided.

What is the proper treatment? It is to suppress the hemorrhage, clear the wound of all foreign matter, and retain the edges in contact.

What are the means of suppressing hemorrhages? Ligatures, compression, and the actual cautery. The tenaculum, needle, and forceps, are the instruments employed to secure bleeding vessels. Ligatures are made of thread, silk, or leather. Compression may be performed by the tourniquet, or by rollers and pledgets.

The actual cautery should never be employed when the bleeding vessels can be secured.

What are the means used for retaining the edges of the wound in contact? Adhesive straps, bandages, and sutures; the object of which is to produce adhesion.

There are two sutures in use; the twisted, and the interrupted.

Punctured Wounds.

How are punctured wounds produced? By sharp narrow instruments such as needles, pins, thorns, splinters of wood, nails, &c.

What are the dangers from punctured wounds? Tetanus, and large collections of matter under the fascia.

What is the treatment? A soft poultice is generally sufficient; but if there are indications of the formation of matter, or nervous symptoms arise, the wound should be freely dilated, and kept open. The use of opium may become necessary.

Penetrating Wounds.

What are the characteristics of penetrating wounds? They are more extensive than punctures, and generally produced by the small sword, bayonet, or dirk.

What are the dangers from penetrating wounds? They may be dangerous from entering large cavities, injury to important bloodvessels, nerves, or viscera; or they may cause extensive collections of matter in deep seated parts.

What is the treatment? The first object is to suppress hemorrhage; which may require extensive incisions. If the bleeding vessel is in the chest or abdomen deep seated, the plan is to diminish the general activity of the circulation by blood letting. In other respects they are to be treated as the constitutional, and local symptoms may demand.

Contused Wounds.

What are the dangers from contused wounds? Gangrene is very liable to take place when they are extensive, and severe.

What is the treatment? They should be treated on common antiphlogistic principles locally, and generally.

Lacerated Wounds.

What are the dangers of lacerated wounds? They are dangerous from their extent, and the parts involved. They bleed sparingly, but are liable to secondary hemorrhage, and to gangrene.

What is the treatment? Bring the parts as near together as possible, and treat the constitutional effects as the condition of the patient may demand.

Poisoned Wounds.

How are poisoned wounds produced? Generally by insects, serpents, rabid animals, &c.

What is the treatment? In the sting of bees, or wasps, the local application of common salt, cold water, aqua ammonia, &c., are useful. In the bites of serpents, olive oil, aqua ammonia, arsenic, &c, have some reputation. The application of a cupping glass to the part has proved useful. When called early the part should be removed entirely In dissecting wounds, apply lunar caustic, after washing clean, and take a mercurial purge.

Gun Shot Wounds.

What is included under the head of gun shot wounds? All injuries occurring from fire arms, explosion of shells, rockets, &c.

What circumstances render gunshot wounds dangerous? The extent of the injury, the parts involved, from their in-

disposition to heal by the first intention, their disposition to slough, and secondary hemorrhage.

What is the general treatment? It is to suppress hemorrhage, and extract the foreign body when it can be done without too much injury to surrounding parts. The applications should be simple, such as water dressings, with sugar of lead and opium.

Abscesses.

What is the treatment of *Abscess* of the *Antrum*? It is to remove one or more teeth corresponding with the floor of the antrum; if the matter is not then discharged pass a stilet or small trocar into the cavity from where the tooth has been pulled and push it into the antrum gradually. Use astringent injections four or five times a day, and keep a bit of bougie or tent in the opening until the discharge and inflammation subside.

What is the treatment of *Mammary Abscess*? The first step is to prevent them if possible by the repeated applications of warm vinegar, topical bloodletting, and a general antiphlogistic course.

If we find suppuration must take place, apply warm poultices, and open in a depending part when fluctuation is perceived.

What are the symptoms of *Lumbar Abscess*? Pain in the lumbar region, extending from the kidney down to the outside of the thigh, testicle of the side drawn up, and pain in the spermatic chord. These are followed by rigors, loss of appetite, and hectic. It sometimes points below the groin, sometimes it passes through the ischiatic notch, and in other cases passes down near the rectum. The discharge is generally thin and gleety, mixed with small flocculi resembling curds, or cheese.

What is the treatment? Very few recover. In the early stages the antiphlogistic course should be adopted, but when matter is formed an opposite course should be pursued.

When the abscess is opened it should be done by a small valvular incision, then closed for a time, and again opened, so as to draw off the matter in a gradual manner.

Ulcers.

How are ulcers divided? Into healthy, unhealthy, and

specific. The first comprehends but one species, the simple ulcer. The second contains two species, the irritable and indolent ulcer. The third contains several species the principal of which are ulcers from scrofula, cancer, fungus hæmatodes, syphilis, and syphiloid, scorbutic, herpetic, lupus or noli me tangere, &c.

Simple Ulcer.

What are the causes of the simple ulcer? Injuries done to a sound part by wound, contusion, abcess, or burn.

What are the characteristics of a simple ulcer? It exhibits a florid appearance, owing to the small, pointed and numerous bright red granulations, which cover it. There is a discharge of healthy pus in small quantity, and the tendency is to heal.

What is the treatment? Simply keep the part in a proper position, and cover the sore with some mild fresh ointment spread on lint, or linen rag. Dry lint is also a good application.

Irritable Ulcer.

What are the characteristics of the irritable ulcer? The edges of the sore are ragged, undermined, and sometimes almost serrated. The parts beyond the ulcer are red, and inflammed; the bottom of the ulcer exhibits irregular hollows which contain a thin greenish, or red acrid matter; and in place of healthy granulations may be found a dark red spongy mass, painful, and bleeding on the slightest touch.

What are the causes of the irritable ulcer? It proceeds from local causes influenced by the state of the constitution, and habits of the patient. The digestive organs in particular are generally disordered?

What is the treatment? The constitutional condition should be attended to; and if the digestive organs are affected resort should be had to steady purging and antimonials, if not contra-indicated.

The proper local applications are poultices, fomentations, cream, a weak solution of the nitrate of silver, and opium mixed with poultices or sprinkled over the sore. The limb should be elevated and pressure and bandaging avoided.

Indolent Ulcer.

What are the symptoms of the indolent ulcer? The granulating surface has a flat shining aspect, and is partly

covered with a pellicle or crust of a whitish or dark grey color. Sometimes the surface is dry but generally there is a discharge of a viscous cohesive fluid. The edges are elevated, smooth, and rounded; beyond the ulcer the parts are swollen, and indurated. The pain is trifling.

What is the treatment of the indolent ulcer? Where an ulcer shows a disposition to become indolent, resort should be had without delay to escharotics, adhesive straps, or the roller. If these do not effect a cure the edges should be pared away, and the whole surface pencilled with the vegetable or lunar caustic. The oak bark poultice followed in a few days by the adhesive strips or roller will sometimes cure. These ulcers frequently require stimulating applications. such as lunar caustic, savin powder, cantharides, capsicum, corrosive sublimate, &c. Dr. Physick considered a combination of ℥j of simple cerate, and ℥ji of British oil as the best cicatrizer. The dressings should be changed repeatedly.

Constitutional remedies also exert a powerful influence, and such remedies as blue pill, and other mercurials should be resorted to.

In healing chronic ulcers care should be taken to establish an issue in some part of the body; otherwise the stoppage of a long established discharge, may give rise to apoplexy, or other serious disturbance.

Varicose ulcers will usually heal with adhesive straps, the roller or laced stocking; but in many instances the enlarged veins can only be relieved by an operation.

Scrofula.

What are the premonitory signs of scrofula? A delicate complexion of a lively red color, mixed with a clear white, the lips red, and the upper one especially thick and protuberant. The pupils of the eyes large, and the conjunctiva free from vessels. These are some of the symptoms which denote the scrofulous constitution.

Children are more subject to it than adults.

What are the symptoms of scrofula? A scrofulous tumour is first a simple enlargement without pain, or unnatural heat; in a short time it becomes tender on pressure, and the heat is augmented; inflammation then generally sets in, and it terminates in abscess, and ulceration, but not always. The matter discharged from abscesses of this kind is thin, gleety, and mixed with flocculi.

What are some of the most obvious causes of scrofula? Cold and moisture, hereditary influence, irregularities of diet, meagre and unwholesome provisions, an impure or tainted atmosphere, deficient clothing, fevers, filth, fatigue, mental anxiety, &c.

What is the proper treatment for scrofula? Invigorate the general system by a light nourishing diet, tonics, and such other means as the general state of the health may require. Flannel should be worn next the skin, and moderate exercise persevered in. Iodine, and its compounds both generally and locally, are valuable in the treatment of most cases of scrofula.

For the scrofulous ulcer, dry lint, the iodine cataplasm, astringent washes, and moderate pressure, are recommended.

Cancer.

What is understood by the term Scirrhus? It is the forerunner of cancer; and characterized by a preternatural density or induration of the soft parts, difficult of resolution, and prone to ulceration. It is unequal in surface, uncommonly heavy, and the skin covering it puckered, and of a faint bluish or leaden hue; with a vehement peculiar, lancinating pain in the part.

What is the treatment of cancer? Extirpation is the remedy most to be depended upon, but from the constitutional nature of the affection this does not always succeed.

Gonorrhœa.

What are the symptoms of gonorrhœa? They are a slight titilation of the glans penis, tumidity of the lips of the urethra, and more or less inflammation of the glans, and prepuce. These are followed by a discharge from the urethra of a thin whitish fluid, speedily changing into a yellow purulent matter of a peculiar smell, attended with pain along the course of the urethra in discharging the urine.

What is the treatment? The constitutional treatment in severe cases is blood-letting, purgatives, and low diet.—Stimulating diuretics, especially balsam of copaiva, and cubebs are beneficial. When the ardor urinae, and discharge diminish we may use astringent injections.

Sypilis.

What is understood by the syphilitic virus? It is a spe-

cific morbid poison, which applied under certain conditions to any portion of the human body will there determine definite and characteristic local phenomena, and if absorbed contaminate the system.

How is syphilis divided? Into primary or local, of which chancre is the exponent. And consecutive, general, or constitutional, which is always the consequence of chancre.

What is chancre? It is a primary veneral sore, produced by the direct action of the syphilitic virus on the inoculated part.

What are the different ways that chancres may be developed? By pustule, ulceration, and small abscess.

What are the stages? There are two; one of ulceration, and the other of cicitrization.

What is the difference in the properties of the matter in these two stages? In the first it is inoculable, and in the second it is not.

How are chancres divided as to location? Into external, and larvated or concealed.

How are they divided in regard to their characteristics? Into follicular, indurated, phagadenic, and furunculous.

What is the index of constitutional affection? Induration of a chancre.

Are buboes classed among the primary or secondary symptoms of syphilis? The primary; and may occur both from sympathy and absorption. If from absorption, they are inoculable, and are included in the term furunculous chancres or chancreous buboes.

What is the treatment of chancre? As it is at first purely a local affection, the specific sore should be converted into a simple one by the application of caustic. Nitrate of silver, protonitrate of mercury, sulphate of copper, potassa cum-calce, &c., are used for this purpose some preferring one and some another. After the separation of the eschar simple dressings such as weak solutions of sulphate of copper, black and yellow washes, aromatic wine, &c., will be proper dressings. Larvated urethral chancres may be cauterized by Lallemand's instrument.

How should buboes from absorption be treated? By antiphlogistics generally; blisters succeeded by a solution of corrosive sublimate, and other antiphlogistic applications locally; after ulceration they should be treated like chancres.

What is the proper treatment for chancre when it becomes

indurated? Induration being the index of absorption which is followed by constitutional symptoms, constitutional remedies become necessary, and mercury pushed to the extent of a very slight impression on the glands is the best remedy.

What are the constitutional or secondary symptoms? Cutaneous eruptions; inflammation of the eye; inflammation and ulcerations of the palate and fauces; induration and ulcerations of the glands of the skin; inflammation of the osseous and fibrous tissues, neuralgia, &c.

Are these affections capable of hereditary transmission? They are; but the primary are propagated from one to another only by inoculation.

What is the treatment? By alteratives; among which mercury stands first; iodide of potassium, sarsaparilla, arsenic, &c., are also useful.

Fractures.

How are Fractures divided? Into simple, compound and complicated, and again into transverse, oblique, comminutive, and longitudinal. A simple fracture is a mere separation of the bony fibres unattended with severe contusion or external wound. A compound fracture is accompanied with an external wound or protruded bone. It is called complicated when the bone is broken in more than one place, combined with luxation, laceration of large vessels, or rupture of ligaments, tendons, &c., or other extensive injury. A fracture is transverse when its direction is perpendicular to the axis of the bone, oblique when it deviates from the perpendicular direction, comminuted when the bone is broken in several places, and longitudinal when it runs parallel with the axis of the bone.

What are the symptoms of fracture? Generally there is crepitus, and when it exists can be relied on. There is also usually deformity, pain, swelling, and inability to use, and move the limb.

What is the prognosis in fractures? It will depend much upon the extent of the injury, constitution, and age of the patient, the kind of fracture, and the bone broken. Complicated and compound fractures are the most dangerous. An oblique fracture is more difficult to manage than a transverse one, owing to muscular contraction.

What is the treatment for fractures? The general indications are to prevent or subdue inflammation, and to coaptate

and retain the fragments in contact, until they are restored by callus.

The former is best accomplished by the anti-phlogistic course and position; and the latter by extension, counter-extension, position, splints, compresses, and bandages. It requires from two to eight weeks to produce consolidation; and some time longer before complete restoration takes place.

Fracture of the Lower Jaw.

What are the symptoms of fracture of the lower jaw?—Crepitation can generally be detected, and the teeth will be found irregular, and often loosened.

What apparatus is necessary? A compress, and a bandage united in the centre and divided at each end near to the middle, so that each loose end may be tied to the one of the opposite side; one of them over the top, and the other at the back part of the head; the united portion of the bandage covering the compress and fracture.

The patient must be nourished with broth or other thin fluid between the teeth.

Fracture of the Vertebrae.

What is the treatment for fractures of the vertebrae? If the patient should survive the immediate effect of the injury; the antiphlogistic course should be adopted, particularly one to relieve inflammation of the spinal marrow; and the urine must be drawn off frequently by the catheter.

Fracture of the Ribs.

What are the symptoms of fracture of the ribs? They are not always distinct unless crepitus exist; there is generally little displacement; but usually pain on respiration, (especially in the recumbent posture), at the seat of the injury; which is increased upon coughing.

What is the treatment? A roller 6 or 7 inches wide should be applied tightly round the chest so as to cause the patient to breath by the diaphragm. The general symptoms should be attended to at the same time.

Fracture of the Sternum.

What are the symptoms? An incessant grating of the fragments upon each other during respiration. The direction of the fracture is commonly transverse.

What is the treatment? The indications are to prevent, or subdue inflammation, and to appease the incessant cough and difficult respiration that usually attend. A roller should be applied also, as in fracture of the ribs.

Fracture of the Clavicle.

What are the symptoms? Crepitation, depression of the humeral beneath the sternal fragment, the shoulder falling below the level of the opposite one, and the peculiar inclination of the head and body towards the affected side.

What is the treatment? The indications in fracture of the clavicle are to carry the shoulder upwards, outwards, and backwards; and to retain it in this position by appropriate apparatus, of which there is a variety in use, some surgeons preferring one, and some another. The plan of Velpeau is recommended by Prof. Mussey in which the fore-arm is brought across the chest with the hand resting on the shoulder of the sound side and secured in this position by proper bandages, and compresses.

Fractures of the scapula can generally be treated by the same position as those of the clavicle.

Fracture of the Arm.

What are the symptoms? Crepitation, mobility of the fragments, and angular displacement, or a tendency to it. A fracture of the neck of the humerus besides the ordinary symptoms of fracture, may be distinguished from dislocation by the rotundity of the shoulder being preserved; while in dislocation there is a hollow under the acromion, and a tumor in the axilla.

What is the apparatus necessary for the treatment? A long roller, and four narrow splints.

When the condyles are fractured a roller, and two angular splints are necessary.

Fracture of the Fore-arm.

What are the symptoms? Crepitation, deformity, and the mobility of the fragments.

What apparatus is necessary in the treatment? Two long compresses; two splints 2½ inches wide, and long enough to extend from the elbow to the points of the fingers; and a roller.

Fracture of the Patella.

What are the symptoms? The transverse fracture which is the most common, is known by the upper half being moved upwards on the thigh, and the patient is unable to rise, or to walk.

What is the treatment, and apparatus? The limb should be placed in an extended position and flexed on the pelvis. The apparatus is a splint two inches wide, long enough to extend from the tuberosity of the ischium to near the heel; two rollers, each six yards long, and three inches wide; and compresses.

Fracture of the Thigh.

What are the symptoms of the fracture of the neck? The limb is generally shortened, its length can be restored without difficulty, and reascends as soon as the extension is removed. Upon rotating the thigh, and placing the hand on the trochanter it will turn as it were upon a pivot; whereas in the sound bone it describes the arch of a circle the radius of which is formed by the neck.

What part of the thigh is most liable to fracture. The middle in young subjects.

What are the symptoms of fracture of the shaft? There are the general symptoms of fracture with shortening of the limb, unless it is transverse, in which case the ends are supported against each other.

What are the indications of treatment? The principal indications are to keep up extension, and counter-extension, for which there is a great variety of apparatus in use.

Fracture of the Leg.

What are the most common varieties? Oblique and transverse fractures of the middle, but it is liable to every variety and in any part. Sometimes one bone is broken, and at others both. A variety of apparatus is used in treatment.

LUXATIONS.

What is a luxation or dislocation? It is the removal of the head of a bone from its corresponding articulating cavity.

How are the varieties of dislocation designated? By the terms simple, and compound; primitive, and consecutive; recent, and old; complete, and incomplete.

Simple luxation is where there is a mere removal of the head of the bone; compound, when an external wound communicates with the cavity of the joint; primitive, when the head of the bone continues in the unnatural position it first assumed; consecutive, when it is removed and becomes fixed in another; recent, and old relate to the duration; complete, and incomplete denote total and partial displacement.

How may luxations be distinguished from fractures? By want of crepitation, by the peculiar distortion and rigidity of the limb, and the shape of the joint.

What are the means generally employed? Constitutional, and local means are both often necessary. Among the former, are blood letting, warm bath, nauseating emetics, &c. The latter are extension, and counter-extension.

In how many ways may the *Lower Jaw* be luxated, and what are the symptoms? Only in one;—anteriorly. The condyles are displaced, the mouth is thrown open and cannot be shut, and the coronoid process projects under the cheek bone.

What is the treatment? The surgeon places his thumb deep in the mouth, and rests them upon the posterior molar teeth while the fingers are carried beneath the chin and base of the jaw. Pressure should be made downward by the thumb, and the chin elevated at the same moment; by which reduction may be effected.

How many ways may the *Clavicle* be luxated? It may be luxated at either end; and the sternal portion in three directions; forward, backwards, and upwards. They are all easily distinguished by their peculiar deformity.

What is the treatment? The same as for fracture of the same bone.

How many ways may the *Arm* be luxated? Downwards, forwards, backwards, and a consecutive dislocation upwards.

How may the *Fore-arm* be luxated? Backwards, laterally, and forwards by a previous fracture of the olecranon.

What are the different luxations of the *Thigh*? Upwards, and outwards, on the dorsum of the ilium; downwards and inwards into the foramen ovale; upwards and forwards on the pubes; and backwards into the ischiatic notch.

The first may be known by a prominence near the superior spinous process of the ilium formed by the great trochanter, together with a shortening of the limb, and an inination of the foot inwards

The second by the limb being lengthened two or three inches; the foot is turned outwards, and the head of the bone in thin subjects may be felt in the foramen ovale.

The third by a hard tumour above Pouparts ligament; the limb is shortened about an inch, the foot is turned outwards, and the trochanter major is in front of the anterior superior spinous process of the ilium.

The fourth by the limb being shortened half an inch, and the foot slightly inclined inwards.

What is the treatment? Extension by pulleys, and counter extension by a band passing over the perineum and resting against the tuber of the ischium.

How may the *Patella* be luxated? Outwards, inwards, and upwards when the ligament of the patella is ruptured.

In what direction may the *Ankle* be luxated? Inwards, outwards, forwards, and backwards; all of which may be easily recognized.

Diseases of the Bones and Joints.

To what diseases are the bones liable? Caries; necrosis; exostosis; spina ventosa; osteo-sarcoma; mollites and fragilitas ossium; and rachitis.

Caries.

What is caries? It is an ulceration of bone.

The soft or spongy bones are the most liable to caries.

What are the symptoms? The affected part swells, there is a softening of the bone, and it crumbles away; there is also a discharge of fœtid blackish matter, and a luxuriant growth of pale fungous granulations.

What is the treatment? When it is dependent upon a syphilitic, scrofulous, scorbutic, or any constitutional disorder, general remedies should be resorted to. When it proceeds from local injury, the indications are to combat inflammation, keep the parts at rest, and remove diseased portions of bone as they become loose. Mineral acids, and gastric juice have also been applied with benefit. Blisters, issues, setons, and steady purging are serviceable in constitutional caries.

Caries of the Spine.

What are the symptoms? The patient complains of numb

ness or an uneasy sensation in the lower extremities, is languid, easily tired, and apt to trip or stumble in walking.

There is often flatulence, sick stomach, and derangement of the digestive organs. Paralysis of the lower extremities occurs in the advanced stages of the disease. There is more or less protuberance at some portion of the spinal column; the spinous processes of which project, and create considerable deformity. The most common seat is the dorsal vertebrae.

What is the treatment? In the commencement benefit may be derived from leeches, blisters, and caustic issues; the latter of which it is often necessary to continue for a long time. The condition of the bowels, and diet of the patient should be strictly attended to, the recumbent posture enjoined, and at the same time the benefit of fresh air should be given.

Necrosis.

What is necrosis? It is where there is destruction of the vitality of bone, and differs from caries as sphacelus differs from ulceration.

What is the treatment? It is to remove the dead pieces of bone when formed.

Exostosis.

What is exostosis? It is an enlargement of the bony structure, and is divided into laminated, circumscribed, tuberculated and spinous exostosis. The bones generally affected are those of the cranium, lower jaw, sternum, ribs, and extremities.

What is the treatment? When it becomes troublesome it should be attempted by general remedies, and low diet. If these fail it should be extirpated.

Spina Ventosa.

What are the symptoms of spina ventosa? It is a tumor involving the whole circumference of a bone, consisting of an osseous shell perforated with numerous holes, containing sometimes a thin sanies mixed with portions of lymph or a cheesy substance.

What is the treatment? A cure may sometimes be produced by long continued pressure; another mode of treatment is to make an opening into the cavity, and throw in

stimulating injections, or by cutting instruments excite such a degree of irritation as to cause it to fill up with granulations. If this fail amputation must be resorted to.

Osteo Sarcoma.

What is osteo sarcoma? It is a malignant disease of the bones. The tumor forming the diseased part is composed of thin bony plates arranged so as to form cells which contain a cheese-like or fleshy matter, or a thin gelatinous fluid.

What is the treatment? In the early stages constitutional remedies may avail something; of which the compound decoction of sarsapalla with corrosive sublimate is perhaps the most efficient. Leeches and blisters have also been applied locally. Amputation when practicable is the only remedy likely to be permanently beneficial, even this often fails, and the disease returns, and attacks some of the internal organs, or another part of the osseous system.

Mollites Ossium.

What are the symptoms? The bone looses its natural firmness; both the animal and saline parts diminish until mere shells are left which are very soft. It is a very rare disease.

What is the treatment? Treatment is of little use; and all that can be accomplished is to support the patient's strength by tonics, and nutritious diet.

Rachitis or Rickets.

What are the symptoms? Disorder of the digestive organs, swelling of the abdomen, emaciatian, dryness or discoloration of the skin, and blackness of the teeth. These symptoms are followed by distortion of different parts of the body, which in bad cases become very much deformed.

What is the treatment? To strengthen the system by tonics, and keep the stomach and bowels in proper condition. Good nutritious diet consisting of animal food has been recommended, also frictions, and frequent bathing in salt water.

Coxalgia or Hip Disease.

What are the terms used to denote this disease? Morbus coxarius, ischias, spontaneous luxation of the os femoris, scrofulous caries of the hip, and abscess of the hip joint.

What are the symptoms? The first symptom is a slight pain in the knee, and emaciation of the limb; then pain is felt about the trochanter and groin which varies in different cases, and is increased by pressure upon the hip joint. In some cases anchylosis is established apparently without the formation of pus; while in others there is a large abscess formed, which discharges itself by one or more openings.—During this process the patient is sometimes worn out by hectic and dies; at other times anchylosis takes place; the openings heal up, and a cure is accomplished with considerable deformity.

What is the treatment? The habit of bending the thigh on the pelvis, and the leg on the thigh, should be corrected by curved splints gradually changed for straighter ones.—Before the abscess forms, blisters, cupping and issues should be used, conjoined with steady purging, vegetable diet, and perfect rest.

During the suppurative stage the strength of the patient should be supported, and such other constitutional remedies employed as are indicated.

Fungus Articuli, or White Swelling.

What is comprehended under these terms? Inflammation of the synovial membrane.

Morbid change of structure in the synovial membrane.

Ulceration of the cartilages of joints.

Scrofulous disease of the joints having its origin in the cancellous structure of the bones.

What is the treatment of the first variety? In the acute form blood-letting, purgatives, low diet, &c. The affected part should be kept in a state of quietude, and elevated.—As internal remedies mercury and sarsaparilla are often indicated.

What is the treatment for the second variety? Amputation is generally the only remedy, and this does not always succeed.

What is the treatment for the third variety? Caustic issues, blisters, setons and absolute rest, anchylosis generally takes place, and may be considered as the safe guard of the patient.

What is the treatment for the fourth variety? The remedies for scrofula should be resorted to; also rest and adhesive strips. In all these varieties when matter is formed in

the joint it should not be let out but an effort made to produce absorption.

Hydrarthus or Dropsy of a Joint.

What is the treatment? Blisters and well regulated pressure will generally be appropriate treatment.

Moveable Cartilage.

What is the treatment? If a laced knee-cap, bandages, &c., have been tried without relief recourse may be had to an operation for its removal.

Anchylosis.

How is it divided? Into complete and incomplete.

In the incomplete variety the ligaments, tendons and surrounding cellular membrane are involved and there is partial movement of the joint.

In the complete form the extremities of the bones often become perfectly united and identified.

What is the treatment? Friction with stimulating articles and judicious movement of the joint, in the incomplete variety.

DISEASES OF THE ARTERIES.

To what diseases are arteries subject? To inflammation, suppuration, ulceration, sphacelus, calcareous concretions, uniform dilation of the coats, and aneurism.

Aneurism.

What is an aneurism? It has been defined to be a pulsating tumour formed of arterial blood?

What are the varieties of aneurism? True, false, circumscribed, diffused, varicose aneurism, and aneurism by anastamosis.

By true aneurism is understood a simple dilation of all the coats of an artery, or the internal and middle ruptured, while the cellular coat remains entire; by false aneurism a rupture or wound of the three coats, so that the blood is extravasated among the surrounding parts.

The terms circumscribed and diffused relate to the form of swelling, or extent of extravasation.

What are the symptoms of aneurism? The tumour is first small, free from pain, and disappears easily by pres-

sure, but returns when the pressure is removed. As it enlarges the pulsation is lessened, and when much enlarged the integuments covering it become painful, livid, crack, ulcerate, and hemorrhage if not arrested sooner, or later destroys the patient.

What is the treatment? Some benefit may accrue by frequent and repeated bleeding; rigid abstinence; confinement to a horizontal position; the internal use of digitalis, astringents, and refrigerants; these remedies cannot be depended on but should be pursued when the ligature from any cause is impracticable. The ligature may be considered as the only means upon which reliance can be placed, and even this often fails, and secondary hemorrhage is the consequence.

What are the rules for the application of the ligature in aneurism? The surgeon should cut for a sound part of the artery above the sac; penetrate cautiously until the pulsations of the artery are discovered; pass an aneurismal needle round, armed with a ligature, detaching it as little as possible from its connections; the ligature should be firmly tied, one end cut off, and the other left hanging from the wound, which should be brought together by adhesive straps.

Aneurism by Anastamosis.

What are the symptoms? It is a tumour formed by a congeries of small arteries and veins with an intermediate cellular structure; as it enlarges it acquires a thrilling pulsatile or jarring motion.

What is the treatment?

Compression, and excision are the means proposed for curing this disease.

Varicose Aneurism.

What is varicose aneurism? It is that form of the disease in which a communication is established between an artery and a vein. It may be produced in any part of the body where a large artery and vein are near each other, and happen to be punctured at the same time.

What is the treatment? Compression, and the ligature are the means recommended.

DISEASES OF THE VEINS.

What are the diseases of the veins? Inflammation, and varicose enlargement.

Varicose Veins.

What are the symptoms? The disease is almost entirely confined to the veins of the lower extremities. In the commencement numerous small circumscribed swellings may be observed; at length the whole venous trunk and branches become enlarged, run in a serpentine course, and appear knotted. As they enlarge the support afforded by the valves is diminished until they are entirely lost. The surrounding cellular membrane becomes inflamed, and gives rise to painful ulcerations.

What is the treatment? Compression with a roller, or laced stocking; astringent washes; an elevated position of the limb; and obliteration of the diseased vein by an operation, of which there have been several kinds proposed and practised; viz: the ligature, the section, and the excision of the vein; all of which are attended with more or less danger.

Cirsocele and Varicocele.

What are the symptoms? Cirsocele is an enlargement or varicose state of the veins of the spermatic cord. Varicocele is a varicose state of the veins of the scrotum. When examined the whole cord appears like a bundle of knotted, and tortuous veins; and feel like a bunch of worms wrapped round and twisted together. The tumour subsides on assuming the horizontal position, and reappears on standing.

What is the treatment? A bag truss should be worn that will suspend the testicles, and give them a firm support.—Cold astringent washes are also recommended. There are several operations proposed, and practiced for this disease upon which the profession is not yet very well settled.

Injuries of the Head.

Fractures of the Skull.

What are the varieties of fracture of the skull? There are several; fissure, counter fissure, depressed, double depressed or camerated, stellated, and punctured fracture.

Fissure is a simple crack or division; counter fissure is a separation produced at a point opposite to that where the force was applied; depressed fracture is when the bones are forced below their natural level; camerated when the sides decline towards the centre; stellated when it radiates from

a centre resembling a star; and punctured when produced by a pointed instrument.

What is the treatment? In simple fracture where the brain, or membrane are uninjured little, or no treatment is necessary. The rule in all cases is not to interfere unless the contents of the skull are affected, and of this the symptoms must be our guide. In cases, however, where sharp points, or ragged edges of bone exist, they may be removed by appropriate instruments to prevent them from irritating the dura mater, or other adjacent soft parts.

Concussion of the Brain.

What are the symptoms? In slight cases there is vertigo, sickness of the stomach, trembling of the limbs, dimness of vision, &c. In severe cases there is insensibility, coldness of the skin, relaxation of the limbs, feeble and irregular pulse, difficulty of breathing, (not however generally stertorous), and dilated pupils.

These symptoms may after a time subside gradually, when a determination of blood to the brain follows, of greater, or less severity.

What is the treatment? If called early, be careful that the importunities of the bystanders do not determine you to bleed before the pulse rises and reaction is established, when it may be proper. Content yourselves with administering a little cold water, or if the depression is very great, wine in small quantities, and with caution. Generally external stimulants, such as mustard plasters, will be sufficient to rouse the system, and are free from the injurious effects of alcohol upon the brain. If inflammatory symptoms come on, blood letting, purgatives, low diet, &c., with cold to the head, an elevated position of it, and blisters become highly necessary.

Compression of the Brain.

What are the causes, and symptoms? It may arise from depressed fracture, effused, or extravasated blood, and from suppuration within the brain, or its membranes.

When symptoms of compression come on from extravasation there is generally an interval between the injury and the appearance of the symptoms; and when this occurs may be considered as characteristic of compression from extravasated blood. When these symptoms are caused by matter

it is the result of inflammation, and does not follow immediately an injury of the skull.

If compression arise from either of the preceding causes it may be known by the pulse becoming slow, and regular; the pupils dilated, and insensible to the strongest light; breathing stertorous, slow, and difficult; the limbs loose, or yielding, perhaps paralytic; and insensibility. These symptoms will be sufficient to distinguish it from concussion, where the distinction is well marked; but often the symptoms are intermixed so as to create confusion and doubt in the mind of the surgeon.

What is the treatment? Blood letting, purgatives, &c. will often alone relieve symptoms of compression.

When the bones are depressed they should be elevated, or if produced by extravasation the trephine must be resorted to and the coagulum removed.

What are the instruments required for operations on the skull? Two or three trephines, the largest about an inch in diameter, and the smallest half an inch; a Hey's saw; a lenticular; raspatory; trepan forceps; two elevators, a small brush, tooth pick, or probe; tenacula; sponges; crooked needles; ligatures and a scalpel.

What are the objects to be attained in the application of the trephine? To make an opening for the removal of coagulated blood, and for the introduction of the elevator beneath a depressed bone. For the former a large trephine should be used, and for the latter a small one. It is not however always necessary to use the trephine in depressed bone, as there is often sufficient space to pass the elevator between the fragments and restore them to their proper position.

To what parts of the skull may the trephine be applied? To all parts, except to the occipital bone.

When it is necessary to trephine the inner table of the frontal sinus, two trephines should be employed; a large one for the external portion, and a small one for the inner.

Inflammation of the Brain.

What are the symptoms? The face becomes flushed, the eyes red, and tender to light, pupils contracted, skin hot, pulse hard and quick, and the tongue dry. The pain in the head is also severe, and the wound if there be one discharg

es a sanious matter. Rigors, follow, which are dangerous symptoms. Delirium, hemiplegia, and convulsions may also come on in the latter stages of the disease.

What is the treatment? The most active antiphlogistic course should be pursued; blood letting, generally and locally, purgatives, blisters, &c. If suppuration take place the trephine may be used but the chance of the patients recovery is very small.

Fungus Cerebri or Encephalocele.

What are the symptoms? It is a tumour having the appearance of a vascular organized growth, which sprouts from the brain after extensive fractures or the operation of the trephine; fills up the opening of the bone, and projects beyond the scalp.

What is the treatment? Light dressings with moderate pressure upon the tumour.

This disease is generally fatal.

Diseases of the Eye.

Conjunctival Ophthalmia.

What are the symptoms? A sense of uneasiness or itching, an impatience of light, diffused redness of the conjunctiva, pain, heat, and swelling of the globe of the eye; an increased secretion of tears, and a feeling as though there was a lodgement of sand in the eye. If the inflammation proceeds there is violent pain in the eyeball, and forehead accompanied by fever and other general indisposition..— Sometimes the conjunctiva throws out a fungus beyond the margin of the cornea, and at others suppuration takes place, followed by destruction of the cornea, and evacuation oi the humours of the eye.

There are several varieties of conjunctival ophthalmia:— The catarrhal, purulent, gonorrhœal, and scrofulous. Some authors however adopt different divisions of the disease from this.

What is the treatment? In the early stage of simple inflammation it may be easily removed by bloodletting, general and local, purgatives, antimonials in nauseating doses, low diet, blisters, lotions of tepid water, a solution of opium, or acetate of lead, or sulphate of zinc. If it runs into the

chronic stage cold astringent washes, and stimulating ointments may become necessary.

For the catarrhal variety the proper remedies are moderate depletion at first, followed by highly stimulating collyria, and ointments.

The purulent variety should be treated upon common antiphlogistic principles, and moderately astringent washes, of which the liquor of the acetate of lead is one of the best.

The gonorrhœal variety may be treated upon general principles but it is seldom cured.

The scrofulous variety does not generally require much antiphlogistic treatment, but rather a tonic course will be indicated. A blister on the nape of the neck kept open, and weak solutions of the nitrate of silver, sulphate of zinc, &c. applied to the eye will be found beneficial.

Sclerotic Ophthalmia.

What are the symptoms? It is an inflammation of the selerotic coat sometimes called rheumatic ophthalmia. The pain in the commencement is generally seated in the temple, and extends to the eyebrow and cheek of the side affected, being most severe at night. There is no purulent discharge or intolerance of light; the sclerotic coat is of a dingy brick-dust tinge; there is more or less fever and derangement of the digestive organs.

What is the treatment? The indications are to restore the functions of the stomach, biliary organs, and skin, by emetics, purgatives, and antimonial diaphoretics, after which bark may be employed to advantage. The best local applications are a blister behind the ear, and the vinous tincture of opium as a collyrium.

Iritic Ophthalmia or Iritis.

What are the symptoms? Severe lancinating pain, extending from the eyebrow to the orbit, and through the globe of the eye to the optic nerve; extreme impatience of light, and morbid sensibility. The conjunctiva does not present the appearance of inflammation, but there are numerous red vessels on that part of the sclerotica connected with the cornea, also on the anterior part of the iris, which looses its brilliancy, and changes to a reddish or greenish hue. The pupil becomes contracted, irregular, and its edge is turned backward toward the crystalline lens; lymph is deposited

on the outer surface of the iris in spots and sometimes so copiously as to obliterate the pupil.

What is the treatment? The antiphlogistic course should be carried to its fullest extent. Obliteration of the pupil should be prevented by breaking up any bands of coagulable lymph which may have formed, with the extracts of belladonna or strammonium applied to the outer surface of the eyelids, or over the eyebrows, two or three times a day, and kept on for half an hour at a time. They should not however be applied during the height of the inflammation.—When it has a syphilitic origin mercury followed up with sarsaparilla should be used.

Psorophthalmia

What is psorophthalmia? It is an inflammation or ulceration of the eyelids; whether caused by small pox, measles, scrofula, erysipelas, or any other cause.

What are the symptons? Children of scrofulous habit are most liable to this disease. The inflammation commences on the edges of the lids, and extends along the conjunctiva with pain and violent itching; suppuration and ulceration sometimes occur, and are very troublesome. The meibomian glands are always involved, and pour out an adhesive fluid.

What is the treatment? In the early stage purgatives and low diet, with the local application of solutions of acetate of lead, sulphate of zinc, or sulphate of copper. In the chronic stage the unguentum hydrargyri nitrati applied to the edges of the lids will relieve the itching, and dispose the ulcerated surfaces to heal. If the disease resists every remedy for a long time, blisters behind the ears and a course of mercury may be tried.

Pterygium.

What is pterygium? It is a thin membranous expansion situated on the conjunctiva; generally occupying the inner angle of the eye in the shape of a triangle, the apex of which looks towards the cornea, and sometimes extends to its centre. A pannus is a pterygium on each side which meet in the centre of the cornea. There are two varieties, the membranous, and fleshy.

What is the treatment? When it becomes troublesome it should be dissected off with a pair of curved scissors.

Encanthis.

What is encanthis? It is an enlargement of the lachrymal caruncle, and semilunar fold. It is sometimes malignant but it is not a frequent disease. The caruncle presents a granulated and livid appearance; if the disease continue a long time, adjoining parts become involved.

What is the treatment? Excision of the diseased parts.

Opacity of the Cornea.

What are the varieties of opacity of the cornea? Nebula, albugo, and leucoma.

Nebula is a superficial opacity produced by chronic ophthalmia, and does not entirely interrupt vision.

Albugo occupies the lamella or substance of the cornea; it is of a white or pearl color, often accompanied by ophthalmia, and is always the result of an effusion of lymph.

Leucoma is a dense callous speck of the cornea of a pure white or chalk color, and has a polished appearance. It is generally produced by a wound or ulcer.

What is the treatmeat? For the first variety astringent collyria, and such other remedies as are proper in chronic ophthalmia. The treatment of albugo is generally difficult and requires highly stimulating applications of which one of the best is the unguentum hydrargyri nitrati applied by a camel's hair pencil to the surface of the speck, once or twice a day. Washing the eye with diluted vinegar has also been recommended.

Leucoma is perhaps seldom or never removed by any treatment.

Ulcer of the Cornea.

What are the symptoms? It is commonly the result of the different varieties of ophthalmia. Sometimes it occupies the whole cornea, and at others it is a simple cavity not larger than the head of a pin, on some particular part of the cornea.

What is the treatment? The sore should be gently touched with nitrate of silver until an eschar forms on its surface; and when it drops off the caustic should be renewed. When the ulcer assumes a healthy appearance discontinue the caustic, and use mild collyria or ointments.

Staphyloma.

What is staphyloma? It is a thickening and opacity of the layers of the cornea with a projection of its anterior surface. It may be produced by small pox, purulent ophthalmia, wounds of the eye, &c.

What is the treatment? There is no remedy; except that an operation may be performed to evacuate the humours of the eye which will prevent the pain and inflammation caused by dust and other extraneous bodies. Blindness of course always exists whether the eye is operated on or not.

Hypopion.

What is hypopion, and its symptoms? It is a collection of purulent matter, formed within the posterior or anterior chamber of the aqueous humour.

There is redness of the conjunctiva, and a yellow spot may be seen at the bottom of the anterior chamber which increases in size until the whole cavity is filled.

Pain, intolerance of light, &c., are very severe, In some cases the inflammation subsides, and the pus is absorbed.—In others ulceration and sloughing of the cornea may take place, followed by a destruction of the eye.

What is the treatment? A prompt antiphlogistic course is the proper treatment.

Hydrophthalmia.

What is hydrophthalmia? It is a dropsy of the eye; and consists of a gradual enlargement of the globe, without at first much pain or injury to vision; but as the disease advances there is pain, impaired vision, &c., which may terminate in irritation, suppuration, and the loss of the eye.

What is the treatment? When it is accompanied with general dropsy, digitalis, squill, volatile tincture of guiacum, and calomel, may be proper. If the accumulation is large paracentesis should be performed.

Obliterated Pupil.

What are the symptoms? The iris becomes wrinkled, and the pupil either entirely effaced or contracted to a very small compass.

What is the treatment? An operation dividing a portion of the iris is the only proper course.

Procidentia Iridis.

What is procidentia iridis? It is a projection of the iris through an ulcer or wound of the cornea. The pain and intolerance of light are excessive.

What is the treatment? When it follows a wound of the cornea it may be replaced; but when it proceeds from an ulcer it cannot be retained in its natural situation while the ulcer exists. The ulcer should be touched with the nitrate of silver, and healed as soon as practicable.

Cataract.

What is cataract, and the symptoms? It is an opacity of the crystaline lens, or its capsule. They differ in color and consistence. Some are fluid and called milky; others are called gelatinous, caseous, or hard, according to their consistence. When the capsule is opaque and the lens remains transparent, or is absorbed, it is called capsular cataract. If a cataract exist from birth it is called congenital. Most cataracts are of a bluish, or pearl color; some are grey, or green; others white; and in some rare instances black.

The symptoms are a diminution of sight; objects appear as if enveloped in mist, or smoke; and vision is very imperfect when suddenly exposed to a strong light. In a dull light the vision is improved; and when the lens is opaque its color will generally indicate the nature of the disease.

What is the treatment? An operation is the only treatment to be depended upon.

What are the opertions in use for cataract? Couching or depression; extraction; and the absorbent practice.

The first is done with a needle; and consists in removing the crystaline lens downwards and backwards into the vitreous humour.

Extraction is performed with a knife; and the opening is made into the cornea.

The absorbent practice is founded upon the solvent power of the aqueous humour: the operation is to break up the crystaline lens, and bring it in contact with the aqueous humor in the anterior chamber It is done in two ways; one is to introduce the needle anterior; and the other posterior to the iris, so that in one case the cornea is penetrated, and in the other the sclerotica. In all instances previous to the performance of any operation the system should be prepared by

purging, diet, &c.; and stramonium, or belladonna should be applied to the parts about the eye.

Congenital Cataract.

What is the treatment? An early operation.

Amaurosis.

What is amaurosis, and what are the symptoms? It is an insensible state of the retina.

The pupil is of a greenish black color, greatly expanded and irregular in shape, has undulating edges, and the strongest light produces no perceptible contraction.

The pupil is occasionally contracted, and in some instances its motions are partially retained. The natural lustre of the eye becomes diminished, or lost.

What is the treatment? When it arises from any organic defect the probability of affording relief is small. If it proceed from gastric derangement emetics, and purgatives will prove useful, followed by tonics. Errhines may also be found beneficial; beginning with the milder, and afterwards using the Turpeth mineral combined with powdered licorice.

Hordeolum.

What is hordeolum? It is a red, inflamed, painful tumour, involving one, or more meibomian glands usually seated on the lower eye lid, near the inner angle.

What is the treatment? Purgatives, and attention to diet. If it becomes indolent apply lunar caustic.

Encysted tumours of the Eyelid.

What is the treatment? Extirpation.

Entropeon.

What is entropeon? It is an inversion of the tarsus or its cilia.

What is the treatment? When there is simply an unnatural direction of the eye lashes they should be removed with a pair of forceps.

When the tarsus is inverted and the skin of the eye lid relaxed there should be an oval piece removed, and the

sides of the wound brought together. Other operations are also practiced.

Ectropeon.

What is ectropeon? It is the reverse of entropeon; the eye lid being turned outwards instead of inwards.

What is the treatment? A portion of the lid of the shape of the letter V should be removed from the outer angle; the thickened conjunctiva should then be dissected off, and the edges of the wound brought together with a fine suture.

DISEASES OF THE NOSE, AND ANTRUM.

Polypus of the Nose.

Where are polypi of the nose generally attached? They may arise from any portion of the Schneiderian membrane; but are mostly attached to the superior, or inferior spongy bones.

What is the treatment? They should be removed with the polypus forceps by a twisting motion rather than by pulling in a straight line.

Ozœna.

What is ozoena? It is an ulceration of the lining membrane of the nostrils, having a fœtid discharge, and sometimes followed by destruction of the cartilages and bones of the nose.

What is the treatment? Bark, iron, mineral acids, muriate of lime, sarsaparilla, and antimony have been recommended. If there is a syphilitic taint connected with it mercury will be proper. Locally, a solution of opium and acetate of lead may be used with advantage.

Fungus or Polypus of the Antrum.

What are the symptoms? It is generally a formidable affection. The tumour sprouts from the lining membrane of the antrum, and grows until it fills the whole cavity; pain is then experienced in the cheek and eye of the affected side, and the face becomes enlarged. These symptoms are followed by distortion of the nose projection of the eye, enlargement of the gums, profuse discharges of sanious matter, &c.

What is the treatment? As soon as the nature of the disease is ascertained it should be completely removed.

Diseases of the Mouth.

Labium Leporinum or Hare Lip.

What are the varieties of hare lip? The single and the double.

What is the treatment? An operation. Some surgeons recommend that we should operate immediately after birth, or within a few weeks, others that we should wait until the child is two or three years old or after the period of the first dentition. It is often combined with a deficiency in the palate and maxillary bones; in which case their closure is more perfect with an early operation. The principal danger of an early operation is a liability to convulsions. The operation consists in paring the edges of the fissure in the lip, and bringing them in contact by the interrupted suture, or pins and figure of 8 bandage.

Ranula

What is ranula? It is an obstruction of one or more of the ducts of the sublingual glands; and gives rise to a tumour or cyst.

What is the treatment? Lay the cyst open freely, and remove a portion of it with scissors. Sometimes the application of caustic becomes necessary.

Malformation of the Frænum Linguæ.

What are the malformations of the frænum linguæ? It is, sometimes too short, so as to prevent sucking.

What is the treatment? A division of the frænum, which should be done carefully, so as to avoid hemorrhage and also not to allow the tongue to fall backwards into the pharynx.

Enlarged Tonsils.

What are the symptoms? A hoarse husky voice, snoring during sleep, excessive wheezing when laboring under cold; and upon inspection they will be found to be enlarged.

What is the treatment? Removal either with the knife, or ligature.

What instruments are used for removing them? Fahnes-

ock's, Physick's instrument modified by Gibson, and Chamberlin's excisor, the latter of which is to be preferred.

Elongation of the Uvula.

What are the symptoms? Irritation about the throat, naus ea, vomiting, and hæmoptysis in some cases.

What is the treatment? Removal with a hook and common scissors, or other suitable instrument.

Epulis or Tubercle of the Gums.

What are the symptoms? It is often a malignant form of tumour which sprouts from the sockets of the incisor teeth of the upper jaw, or from the gum between the teeth.

What is the treatment? Extirpation in its very incipiency is the only chance for a permanent cure.

DISEASES OF THE NECK.

What diseases are included under this head? Lodgement of foreign bodies in the pharynx, larynx, trachea, and œsophagus; stricture of the œsophagus, ulceration of the glottis, bronchocele, wry neck, &c.

Extraneous bodies in the Œsophagus.

In what manner may extraneous bodies in the œsophagus produce death? By producing spasmodic action of the muscles of the glottis; from distension of the œsophagus so as to press upon the trachea and close it; or by producing inflammation or gangrene from the continued pressure; or by violent attempts in removing them.

What is the treatment? When the substance is large it generally sticks in the pharynx, from which it may be removed by the finger, or a pair of forceps. Articles that can be digested provided, they have no hard rough points should be pushed into the stomach by a probang, unless they can be easily reached. Coins, and sharp ragged bodies should be extracted by forceps, probang hook, or some other contrivance.

When it becomes necessary to push any of these articles nto the stomach purgatives and mucilaginous draughts should be taken. Dr. Physic prescribed rice in large quantities, for the purpose of defending the coats of the stomach.

Stricture of the Œsophogus.

How are they divided? Into spasmodic, and permanten

which are sometimes combined. Its most common seat is at the commencement of the œsophagus.

What are the symptoms? Difficulty of swallowing, pain in the stomach, nausea, troublesome eructations, and pain in the fauces.

What is the treatment? Bougies, with or without lunar caustic. In the spasmodic variety, camphor, opium, and ether are serviceable.

Removal of extraneous bodies from the Larynx and Trachea.

What operation is performed for this purpose? *Laryngotomy, and tracheotomy.*

The former is the one generally adopted.

In performing this operation should the incision be made at once into the larynx? No; the integuments should first be divided, and the hemorrhage entirely stopped; then the crico-thyroid membrane may be divided.

In what other cases are laryngotomy and tracheotomy resorted to? Sometimes from substances lodged in the œsophagus, for croup, for enlargement of the tongue and tonsils, ulceration of the glottis, &c.

Bronchocele or Goitre.

What is bronchocele? It is an enlargement of the whole, or a part of the thyroid gland. Its causes are not satisfactorily understood.

What is the treatment? Iodine, internally and externally.

Torticollis or Wry Neck.

What are the causes? Contractions of the platysma myoides, or sterno-cleido-mastoideus, cicatrices of burns, paralysis, &c.

What is the treatment? When it proceeds from morbid contraction of the muscles they should be divided and the head brought into a proper position.

Hernia.

What is hernia? It is a protrusion of any of the contents of the abdomen, covered by peritoneum, through the parietes of the abdomen.

What are the divisions of hernia? Hernia is divided into reducible, irreducible, and strangulated. It may also be

ermed from its contents enterocele, epiplocele, and entero-epiplocele.

Reducible hernia is when it is easily replaced.

Irreducible hernia, when there is permanent protrusion.

Strangulated hernia, when the parts are confined by stricture.

Enterocele, when the protrusion consists of intestine.

Epiplocele, when it consists of omentum.

Entero-epiplocele, when it consists of intestine and omentum together.

There are also names given from the position they occupy.

Bubonocele, or inguinal hernia.

Oscheocele, or scrotal hernia.

Merocele, crural or femoral hernia.

Exomphalos, or umbilical hernia.

Congenital, when it exists at birth.

Ventral, when the protrusion occurs in different parts of the abdomen without reference to natural openings.

Ventro-inguinal, when there is a combination of the two varieties.

What is the sac of a hernia? It is the peritoneal investment which surrounds the protruded viscera. That portion communicating directly with the abdomen is called its mouth; that portion most remote is its fundus; and the part surrounded by the aperture in the tendinous parieties, the neck.

What are the causes of hernia? The exciting causes are severe exercise, lifting heavy weights, playing on wind instruments, vomiting, costiveness, coughing, jumping, &c.

The predisposing are hereditary conformation, and preternatural laxity of the abdominal parieties.

What are the symptoms of reducible hernia? The tumour descends in the erect position, and retires by gentle pressure, or a recumbent posture.

If the sac contains intestine its reduction is accompanied by gurgling; the tumour will also have a tense, elastic feel. Omentum on the contrary, communicates a doughy sensation, and is restored to the abdomen with greater difficulty. Reducible hernia is larger after a meal, and an impulse is communicated to the finger when the patient is directed to cough.

There is generally more, or less disorder of the digestive organs.

What are the causes of a hernia becoming irreducible?

It may arise from adhesion between the sac and its contents; from membranous bands; and from extraordinary enlargements of the omentum or increase in the volume of intestines. Slow inflammation is the most frequent cause of hernia being changed from the reducible to the irreducible condition.

What are the symptoms of strangulated hernia? In addition to the other symptoms of hernia there is obstinate costiveness, general soreness of the abdomen, pain around the navel; sickness of the stomach, and severe pain in the tumour. These symptoms may be followed by bilious or stercoraceous vomiting, hiccup, quick, hard pulse, cold sweats, and great anxiety of countenance. If relief is not obtained the pulse becomes thready, the patient easy, the tumour crackles when pressed upon, and assumes a leaden color, enormous distention of the abdomen takes place, the pulse becomes fluttering, and death ensues.

What is the general treatment of hernia? For reducible hernia an appropriate truss is the proper treatment; and the patient should never be without one capable of retaining the tumour.

For irreducible hernia a suspension of the tumour by a bag truss, and strict attention to diet is all that can be done.

For strangulated hernia the proper remedies are blood-letting, purging, cold, and warm baths, opium, fomentations, poultices, cold, the taxis, tartarized antimony, tobacco injections, and an operation.

Inguinal Hernia.

Through what openings do the contents of an inguinal hernia pass? Through the internal abdominal ring, inguinal canal, and the external abdominal ring.

Suppose a dissection is made of the coverings and contents of an inguinal hernia commencing at the skin, what will we find? The integuments, superficial fascia, cremaster muscle, hernial sac, omentum, or intestine, or both.

How is inguinal hernia distinguished from hydrocle? The tumor of hernia commences above or at the external abdomina ring, and descends towards the scrotum; whereas hydrocele commences below, and gradually ascends.

How is it distinguished from cirsocele? Place the patient in a horizontal position, press firmly on the upper part of the ring; then direct him to rise; when if it be cirsocele the tumour will reappear, with an increase of size; on the contrary hernia will not show itself until the finger be removed.

What is meant by concealed inguinal hernia? It is a hernia contained within the canal leading from the internal to the external ring.

In operating for inguinal hernia what parts are divided? The integuments, superficial fascia, cremaster muscle, and the sac.

Where is the seat of stricture in inguinal hernia? In very old and large ones the external ring, but in recent cases the internal ring; these strictures should be divided upwards in all cases so as to avoid wounding the epigastric artery.

Femoral Hernia.

Through what opening are the contents of a femoral hernia protruded? Beneath Poupart's ligament through the crural ring.

How is the ring bounded? On the outer or iliac side by the femoral vein; on the inner or pubic side by Gimbernat's ligament; anteriorly by Poupart's ligament, and posteriorly by the pubes.

In dissecting a femoral hernia commencing at the bend of the thigh what parts will be presented? The integuments, superficial fascia, fascia propria, which was originally loose cellular membrame occupying the orifice of the crural ring, and the hernial sac.

What is the treatment? For reducible an appropriate truss.

For strangulated the treatment must accord with the general principles proper in hernia.

Where are the points of stricture of femoral hernia? At Hey's ligament, in the crural sheath, at Gimbernat's ligament, or at the mouth of the sac. In dividing these strictures the knife should be turned upward, and slightly inwards in making the incision. If turned outward the crural vein and epigastric artery might be injured, or if too far inwards the obturator artery may be endangered.

Umbilical Hernia.

Through what opening do the contents of umbilical hernia protrude? The umbilical ring, either at its centre or edges.

What forms the outer covering of congenital umbilical hernia? The cellular membrane that connects the vessels of the cord; the inner, or sac, is a portion of peritoneum.

What forms the covering of the protruded viscera of young subjects and adults in umbilical hernia? The common integuments, superficial fascia, and peritoneal coat.

What is the treatment? The congenital variety unless there is some considerable deficiency of parts or morbid complications may be often cured by a bandage; or by reducing the intestines, and surrounding the sac with a firmly drawn ligature so as to produce sloughing, and cause the edges of the ring to cicatrize.

For umbilical hernia of young subjects and adults, a properly contrived truss is the proper treatment; or a small compress etained in its proper place by a bandage, or adhesive straps

For strangulated umbilical hernia the usual remedies should be used, and if they fail an operation must be resorted to.

Congenital Inguinal Hernia.

In what respect does congenital hernia differ from common inguinal? It is destitute of a distinct peritoneal sac, in being lodged in the tunica vaginalis in contact with the testicle, and the spermatic cord and artery lie behind the hernia.

What is the treatment? A well contrived truss, and when strangulated an operation may be required unless relieved by the usual remedies.

Artificial Anus.

From what does it proceed? A mortified intestine in strangulated hernia; in which case the sound portion adheres to the neck of the sack, the portion protruded sloughs, is thrown off, and the fæces are discharged externally.

What is the treatment? Nature often affects a cure; it is not best therefore to be too officious in the early stages, but simply apply a truss with a broad pad to the opening

which will retain the fæces. In this disease the upper and lower portion of intestine lie side by side; and a very ingenious operation was suggested and practiced successfully by Dr. Physick; the principle of which is to produce adhesion between these two portions, then divide the barrier between them, and by that means establish a communication between the upper and lower portions, and suffer the external opening to close. This adhesion was produced by passing a crooked needle armed with a ligature within the orifice of one gut and bringing it out at the other, traversing in its passage the coats of each, the ends of the ligature were then tied in a loose loop.

Diseases of the Rectum.

Prolapsus Ani.

What are the causes of prolapsus ani or inversion of the lining membrane of the rectum? Habitual costiveness, straining at stool, diarrhœa, dysentery, hemorrhoids, strictures, stone, drastic purgatives, &c.

What is the treatment? The parts should be returned as soon as possible by gentle pressure. If there is much inflammation, bloodletting, general, and local, mild cathartics, cold poultices, astringent washes, &c., should first be resorted to. Where the parts become indurated, and incapable of reduction it may become necessary to remove them, either with the ligature, or knife.

Hemorrhoids.

What are hemorrhoids? They are tumours situated about the rectum, sometimes distinguished as internal, and external, from their situation; blind, and bleeding, according as they are attended or not with hemorrhage,

They may consist of varicose enlargements of veins, or from blood poured into cysts formed by cellular membrane, or from a more organized growth.

What is the treatment? To palliate urgent, or present symptoms recourse may be had to leeches, cold astringent washes, astringent ointments, rest, &c. They may by be coming large, and troublesome, or irreducible, require an operation, either by the knife, or ligature. When they consist of varicose enlargements the ligature should always be used; on the contrary in the other kinds the knife may be proper.

Fistula in Ano.

What is fistula in ano? It is an abscess about the verge of the anus with one or more small openings. If the opening communicates with the rectum and not with the integuments it is called internal fistula; if it opens upon the surface of the integuments it is an external fistula; and if there is an opening both internal and external it is called a complete fistula.

What is the treatment? Absolute rest, moderate diet, and mild laxatives.

When the disease is long established an operation becomes necessary, unless consumption exists, in which case the fistula ought not to be healed.

Diseases of the Testicle and Penis.

Hydrocele.

What is hydrocele? It is a collection of water in the tunica vaginalis; and forms an elastic pyriform tumour which at first occupies the lower part of the scrotum, and gradually extends upwards.

What is the treatment? An operation is generally required; and is either palliative, or radical.

The palliative operation is simply the evacuation of the fluid by a lancet, or small trocar.

The operation for radical cure may be performed by laying open the tunica vaginalis; by passing a seton through it; by applying caustic; by extirpating a part of the tunica vaginalis; by the introduction of a tent; and by injection after the water has been evacuated.

The latter operation is the one usually performed, and generally with success when properly done. There are several different articles made use of for the purpose of injection.

Hæmatocele.

What is hæmatocele? It is a collection of blood, either in the tunica vaginalis testis, within the tunica albuginea, or in the cellular membrane of the scrotum. It may proceed from injury of one or more of the blood vessels of the scrotum.

What is the treatment? If the extravasation is small it

will probably be absorbed in a short time. If it is not, an incision should be made, and the blood evacuated.

Phymosis.

What is phymosis? It is where the prepuce is contracted in front, and cannot be drawn over the glans penis.

There are two varieties; the natural when it exists at birth; and the preternatural when it occurs at any other period of life.

What is the treatment? An operation; either by slitting up the prepuce, or removing a small portion by circumcision.

In preternatural, when attended with high inflammation the best remedies are local bleeding, emollient poultices, fomentations, &c.

Paraphymosis.

What is paraphymosis? It is where the prepuce is firmly retracted behind the corona, leaving the glans penis uncovered, and sometimes producing great constriction and swelling. It may be congenital or acquired.

What is the treatment? Cold, the antiphlogistic course, and steady pressure kept up for several minutes. In extreme circumstances the stricture must be divided.

Diseases of the Urethra and Bladder.

Stricture of the Urethra.

How are they divided? into permanent, spasmodic, and a combination of the two.

What part is the common seat of stricture? Usually behind the bulb about seven inches from the extremity of the glans; also at the distance of four or five inches; and three and a half inches; sometimes the orifice itself is the seat of stricture.

What are the symptoms? The constitutional symptoms are disorder of the digestive functions, general irritability, severe chills, followed by high fever, and profuse perspiration; the febrile paroxysm is not however an invariable attendant.

The local symptoms are a slight discharge of matter from the urethra, a frequent desire to urinate, the urine issues in drops or in a forked, twisted, wiry, or thread like stream,

nocturnal omissions, scalding of the urine, &c. Excess in eating, drinking, and cold, aggravate all these symptoms.

What is the treatment? The first object is to ascertain the position and extent of the stricture; which may be done by a bougie, catheter, or urethra sound.

There are three methods of cure. Dilatation by bougies; destruction by caustics, and division by a stilet.

Fistula in Perinaeo.

What is fistula in perinaeo? It is an abscess communicating externally, and with the urethra internally. It may proceed from strictures of the urethra, or from blows or other injuries.

What is the treatment? If it depend upon stricture the first indication is to get rid of that; if the canal anterior to the fistula becomes obliterated it can only be accomplished by an operation. When the fistula is pervious it should be dilated with bougies, or such other means as the case may require.

Retention and Incontinence of Urine.

What are the causes of retention of urine? Severe gonorrhoea, strictures of the urethra, enlarged prostate, spasm of the neck of the bladder, stone, hemorrhoids, fistula in ano, stimulating diuretics, blisters, &c.

What are the remedies for retention of urine? The warm bath, blood-letting, purgatives, opiate enemata, the catheter, forced injections to overcome obstructions, and puncture of the bladder. When it is necessary to puncture the bladder it should be done either through the perineum, above the pubes, or through the rectum; the operation of puncturing above the pubes is the one generally performed.

What is the treatment for incontinence of urine? The nternal use of cantharides, muriated tincture of iron, bark, opium, cold bath, and blisters, either singly or conjoined in such manner as may be indicated.

Urinary Calculus.

Where are urinary calculi found? In the kidney, ureter, bladder, prostate gland, or urethra, but they are mostly found in the bladder.

What are the symptoms of stone in the bladder? Fre-

quent desire to make water, and severe pain on voiding the last drops of it; sudden stoppage of the urine while passing, and flowing again frequently by change of posture, and tenesmus. Sounding is however the only positive symptom, and should always be done before a course of treatment is adopted.

What is the treatment for urinary calculus? When there is a calculus passing the ureter decisive treatment should be adopted. Blood should be drawn freely if the patient is robust, and a brisk purge given, the warm bath and spirits of turpentine, or spirits of turpentine and opium may be used with benefit; the tincture of the poke berry juice has also been recommended. When the bladder contains a stone the operation of lithotomy, lithotrity, or lithotripsy must be performed.

Amputation.

What are the injuries for which amputation is resorted to? Gun shot wounds and fractures, mortification, tumors, diseased joints, and ulcers.

What circumstances influence us in regard to the propriety of amputation in gun shot wounds and fractures? When the chief arteries of a limb are divided, the muscles lacerated, and the bones badly broken amputation should be performed; also when complicated with severe injury of the joints.

What tumours may render amputation necessary? Osteosarcoma, spina ventosa, exostosis, fungus haematodes, &c.

PART V.—OBSTETRICS.

The Pelvis.

Where is the pelvis situated, and of what is it composed? It is between the last lumbar vertebra and the superior extremities of the thigh bones.

It is composed of four bones in the adult; on its posterior and inferior parts by the sacrum and coccyx; and on its lateral, inferior, and anterior parts by the ossa innominata.

What are the characteristics of the Sacrum? It was originally composed of five pieces—its figure is triangular, with the base upwards; has four surfaces, an anterior, posterior, and two lateral; and is pierced by four holes on each side for the passage of the sacral nerves. Superiorly it is attached to the last lumbar vertebra, and laterally to the ossa innominata. Its length is from four to four and a half inches, breadth about four inches, and the depth of its concavity is about three-fourths of an inch.

What are the characteristics of the Coccyx? It is 1¼ inches in length, pyramidal, has its base upwards, articulates with the sacrum, and is composed of three or four bony portions.

What are the characteristics of the Ossa Innominata? They are on each side, divided into three portions which were originally distinct; the ilium, ischium, and pubes.

The ilium on each side forms the highest lateral portion of the pelvis; the superior edge is nearly semicircular, tipped with cartilage, and called the spine; the external surface is convex, and called the dorsum; the internal is concave, and called the fossa. It has two anterior, and two posterior spinous processes, forms with the os pubis the

linea ileo-pectinea, and with the pubes and ischium the acetabulum.

The ischium is the lowest of the three bones, on each side; it terminates in a tuber below from which a process runs upwards to join the pubis.

The pubis is the smallest of the three; its longest portion forms a part of the acetabulum; it then diminishes in size, stretches over to join its fellow of the opposite side, and sends a branch downwards to unite with a portion of the ischium in such manner as to leave an opening, the foramen ovale.

The innominata are joined posteriorly to the sacrum by cartilages and appropriate ligaments: the anterior junction is called the symphysis of the pubes.

Where are the Sacro-sciatic ligaments situated? The posterior arises from the posterior inferior spinous process of the ilium, from the lower margin of the sacrum, and from the first bone of the coccyx; is inserted into the internal margin of the tuberosity of the ischium, and is extended along the internal face of the crus.

The anterior is placed in front, and arises from the margin of the lower part of the sacrum, and the lateral margin of the coccyx; the fibres converge and are inserted into the spinous process of the ischium. This is the arrangement on each side of the pelvis.

How is the pelvis divided? Into the large and small, or false and true; or the pelvis above and below the brim.—The line of demarcation being the linea ileo-pectinea at the sides, the crista of the pubis in front, and the promontory of the sacrum behind.

What is the distinction between the male and female pelvis? The male pelvis has a contracted brim of a rounded form or triangular shape, with the promontory of the sacrum projecting. The female pelvis is spacious, of an oval shape, with the sacrum slightly prominent, and greater space is afforded for the passage of the child. The cavity of the male pelvis is deep, while in the female it is shallow.

In the male there is a contracted angular arch of the pubes; in the female there is a spacious and well rounded arch, and the tuberosities of the ischia are much wider apart. The length of the sacro-sciatic ligament, and the mobility of the coccyx upon the sacrum serve also to distinguish the female pelvis.

What are the parts of the pelvis the diameters of which are important? The brim, cavity, and outlet.

What are the superior and inferior openings sometimes called? The superior, and inferior straits.

What are the diameters usually measured of the brim, cavity and outlet?

The straight or antero-posterior; the transverse; and the oblique.

What are the measurements of the brim or superior strait? The antero-posterior from the promontory of the sacrum to the symphysis is 4.3 inches; the transvere from the middle of the linea ilio-pectine of one ilium to the other is 5.4 inches; and the oblique from one sacro-iliac symphysis to the acetabulum opposite is 4.8.

What are the measurements of the cavity? The antero posterior frem the centre of the hollow of the sacrum to that of the symphysis is 4.8 inches; the transverse from the point corresponding to the lower margin of the acetabulum on one side to that of the other is 4.3 inches; and the oblique drawn from the centre of the free space formed by the sacro sciatic notch and ligaments on one side to the foramen ovale of the other is 5.2 inches.

What are the measurements of the outlet or inferior strait? The antero-posterior from the point of the coccyx to the lower edge of the symphysis pubis is 3.8 inches but during labor the mobility of the coccyx may allow this diameter to be increased one inch, or to 4.8 inches; the transverse from one tuberosity of the ischium to the other is 4.3 inches; and the oblique from the middle of the lower edge of the sacro-sciatic ligament of one side to the point of union between the ischium and descending ramus of the pubes on the other is 4.8 inches.—*Rigby*

What is meant by the axes of the pelvis? They are lines drawn at right angles with the planes of the straits through their centres.

What relation does the axis of the superior strait bear to the horizon? It forms an angle between 50° and 60°. A line drawn from the umbilicus to the point of the coccyx will represent the axis of the superior strait.

What is meant by the inclination of the pelvis? The angle which the axis of the superior strait forms with the horizon when a woman is in the upright position marks what is called the inclination of her pelvis.

What relation does the axis of the inferior strait bear to the superior? It forms with it nearly a right angle; and is represented by a line drawn from the sacrum just below the promontory perpendicular to the plane of the inferior strait. The angle which the axis of one strait forms with the horizon is inverse to that of the other.

What is the shape of a line that will represent the axis of the pelvis? It will be a curved line, the shape of a male catheter passing through the centre of a series of planes extending from the sacrum to the pubes, from the linea-ileo-pectinea to the coccyx and sub-pubic ligament.

What is the arrangement of the two lateral inclined planes within the pelvis on each side? They are divided into anterior and posterior.

The anterior commences near the sacro-iliac symphysis, extends to the symphysis pubis, passes downwards and forwards in front of the spine of the ischium, and over the obturator foramen, terminating on the anterior edge of the ramus of the pubis and ischium.

The posterior commences at the sacro-iliac junction, extends to the middle line of the sacrum, passes downwards and backwards behind the spine of the ischium over the sacro-sciatic foramen, and sacro-sciatic ligaments, terminating on the posterior edge of the tuberosities of the ischium, the lower edge of the sacro-sciatic ligament, and point of the coccyx. These planes influence the presenting part of the fœtus; when the occiput is brought in contact with the pelvis anterior to the spine of the ischium, it will pass down upon the anterior inclined plane, and emerge under the arch of the pubes; but if it enter the pelvis behind the spine of the ischium, it will pass down the posterior inclined plane, rotate into the hollow of the sacrum, and emerge at the posterior commissure of the vulva.

Of Deformity of the Pelvis.

What is meant by a deformity of the pelvis? Any deviations from its healthy dimensions, either by excess or diminution.

What are the evils arising from an excess in size? Precipitation of the uterus within the pelvis during gestation, with its consequences; and during parturition a too rapid labor, which may cause alarming hemorrhage.

What are the remedies for the difficulties arising from an

excess in size? For the first, a proper sized pessary, or a utero-abdominal supporter.

For the second, forbidding the woman to bear down during labour; opposing the too rapid escape of the child by pressing on its head, or the perineum of the mother, and hemorrhage may be much diminished by brisk frictions on the abdomen over the uterus, and by ergot.

What are the usual causes of distortions of the pelvis? Rachitis in infancy, and melacosteon in old age.

What portion is generally distorted? The upper strait; and this in its antero-posterior diameter; when the inferior strait is distorted it is generally in its transverse diameter, by the approximation of the tubers of the ischia.

There is not however any portion but what is liable to deviation from its healthy measurements.

What is the smallest antero-posterior diameter of the superior strait that will allow a labor to be terminated successfully? Three inches; if there is even three and a half, labor is rendered tedious, painful, and uncertain.

In what position would you keep a child affected with rickets, to prevent deformity of the pelvis? In a horizontal one, and permit it to exercise its limbs freely upon a bed or matrass.

To what other deformities is the pelvis liable? Exostoses, and tumors.

What are the means proposed for measuring the pelvis? The pelvimeter, intro-pelvimeter, caliper, by the introduction of the finger against the most projecting part of the base of the sacrum, and by the introduction of the hand, in time of labor, and placing the fingers edgewise between the posterior part of the symphysis and the projection of the sacrum. The finger and the hand are most to be depended upon.

Of the Childs Head.

What are the principal diameters of the childs head? The oblique, from the symphysis of the chin to the posterior and superior extremities of the parietal bones, or the posterior extremity of the sagittal suture measuring 5 inches; the longitudinal from the centre of the forehead to the top of the lambdoidal suture measuring 4 inches; the perpendicular, from the summit of the head to the base of the cranium measuring from 3 to 3½ inches; and the transverse,

from one parietal protuberance to the other measuring from 3 to 3½ inches.

Are these diameters ever altered during the progress of labour? They are liable to be from the suppleness of the bones of the head of the fœtus; but all cannot be diminished or increased at the same time; if one is diminished another must be increased. The extent to which these changes may take place varies in individual cases owing to the more or less perfect ossification of the bones.

What are the sutures of the fœtal head? The sagittal or the line of union from the occipital bone to the root of the nose, connecting the parietal and the two sides of the frontal bone with each other; the coronal which connects the anterior portions of the parietal and the posterior portions of the frontal bone; the lambdoidal which connects the posterior portion of the parietal and the anterior portion of the occipital bones.

What forms the anterior fontanelle, and how is it distinguished? It is formed at the points of decussation of the sagittal and coronal sutures. It is distinguished by four bony angles, the edges of which are tipped with cartilage, and are smooth, soft, and yielding.

What forms the posterior fontanelle, and how is it distinguished? It is formed at the points of junction of the posterior end of the sagittal with the centre of the lambdoidal suture, and has three bony angles; two by the parietal, and one by the occipital bones.

What parts of the head are of most importance to understand in order to determine the presentations? The sutures, and fontanelles.

To what extent may the head be rotated on the trunk with safety to the child? One quarter of a circle, and not more.

Of the Genital Organs.

How are the organs of generation, and parts concerned in delivery divided? Into internal, and external. The external consists of the mons veneris, labia, clitoris, nymphæ, meatus urinarius, hymen, orifice of the vagina, caruncula myrtiformes, frænum labiorum, fourchette, fossa navicularis, and perineum.

The internal are the uterus, fallopian tubes, ovaria, ligaments, and vagina.

Where is the mons veneris and the other external organs situated? The mons veneris is an accumulation of cellular and adipose membrane covering the pubes.

The labia are two bodies of a similar texture to the mons veneris, running parallel from it in a downward and backward course.

The clitoris is directly beneath the superior union, or origin of the labia; it consists of two crura which unite and form its body, the external termination of which has been called its glans.

The nymphæ are two similar bodies depending from the clitoris, which separate and run downwards towards the os externum.

The orifice of the urethra is found between the inferior portions of the nymphæ. The canal of the urethra is about 1½ inches in length.

The orifice of the vagina is below the orifice of the urethra, and immediately under the symphysis pubis.

The hymen is a membranous expansion at the orifice of the vagina, and partially closing it.

The caruncula myrtiformes are small fleshy vascular bodies situated at the external orifice of the vagina upon which in the virgin state the hymen appears to spread itself.

The fourchette is a semilunar fold in advance of the hymen.

The fossa navicularis is between the hymen and fourchette.

The perineum is the space directly behind the inferior termination of the labia and before the anus, about an inch and a half in width.

Where is the vagina situated? It is a dense elastic canal, lined with mucous membrane which leads directly from the external organs to the uterus; its course is a little downwards and then upwards; and the length is from 4 to 6 inches. The mucous membrane is thrown into folds or rugæ.

Where is the Uterus situated, and what are its characteristics? In the cavity of the pelvis, at the upper extremity of the vagina with the bladder in front, and the rectum behind. It is 2½ inches long of a pear shape, a little flattened, with its small extremity hanging into the vagina. It is divided into fundus, body, and neck.

The fundus is that portion above the origin of the fallopian tubes; the body is the part extending from them below

to the commencement of the neck; and the neck is that acuminated portion which dips into the vagina, and terminates in the os tincae. Its structure is muscular, and the internal cavity is triangular, and lined by a fine membrane which secretes the menstrual fluid.

Where are the Fallopian tubes situated? They are connected with the uterus on each side at a line which would divide the fundus from the body. They are tortuous hollow bodies 4 or 5 inches long, with the uterine extremity small, and terminating at the other extremity in an opening of some capacity, which is surrounded by an uneven frill called the fimbria.

Where are the Ovaries situated? They are two small, roundish bodies about the size of a nutmeg, near to the abdominal extremities of the fallopian tubes, in the folds of the lateral or broad ligaments, one on each side, and are the seat of conception.

What are the ligaments of the uterus? The broad; the anterior or round; and the posterior or utero-sacral ligaments.

Where are they situated? The broad ligaments are duplicatures of the peritoneum as it passes from the uterus to the lateral portions of the pelvis, one on each side.

The anterior or round ligaments arise from the superior and lateral parts of the uterus, run in the doublings of the broad ligaments, pass over the brim of the pelvis, through the abdominal rings, and loose themselves in the groins.

The posterior ligaments arise from the posterior portion of the neck of the uterus near its middle, diverge and ascend towards the middle of the lateral edges of the sacrum, and are lost in the cellular membrane covering that bone.

What arteries supply the uterus with blood? The spermatics, and hypogastrics.

The nerves are supplied from the intercostal, the renal plexus, and the sacral.

Menstruation.

What is meant by menstruation? It is that function in which the uterus periodically secretes a sanguinolent fluid.

What part gives origin to this secretion? The internal coat of the uterus.

What are the characteristics of this secretion? It

resembles blood, has a peculiar quality and odor, it is not coagulable, nor does it putrify readily.

At what period does menstruation take place? It takes place at puberty, or that period at which the animal is capable of propagating its species; the age varies under the influences of climate, constitution, and modes of life; earlier in hot than cold countries, sooner in cities than in the country, &c.

What are the symptoms which precede menstruation? The mammæ increase in size, the voice is changed, the pubes are covered with hair, the best proportions are developed, and the mind is rapidly matured.

Besides these there is headache, dullness of the eyes, pains in the pelvic region, lassitude, whimsical appetite, leucorrhea, &c., which gives place to a discharge from the vagina.

What is the menstruous period? From four to six days; and during this time from four to six ounces of fluid are discharged.

What are general symptoms during the menstrual flow? The appetite becomes capricious, the person is languid, pale, or hectically florid, dark under the eyes, and frequently there is a dragging sensation about the hips and loins.

At what age does it cease? From forty-five to fifty. In this climate at about forty-six or seven.

Does the regular appearance of the menses every twenty-eight days indicate a capability for procreation or reproduction? It does.

Is the uterus influenced by any of its appendages in this function? The ovaries appear indispensible to it; as their absence either natural, or by removal prevents the appearance of the menses

Is menstruation a physiological or a pathological condition? It is strictly a physiological function.

Is the cause of menstruation well understood? It is not; there have been many theories formed to account for it, but they are not satisfactory.

Derangement of the function of Menstruation.

To what derangements is this function liable? To a too tardy appearance of the menses.

To its interruption after having been established.

To excess of quantity.

To menorrhagia.

To dysmenorrhœa or painful menstruation.

And to irregularities towards the decline of life.

At what period of life in this country does menstruation take place? From the fourteenth to the fifteenth year.

Does age of itself present an indication for interference in regard to this function? No; there should be other evidences of womanhood; and when these are absent the girl should never be tortured by emmenagogues. These signs are enumerated under the head of menstruation.

What should be done where these signs to a greater, or less extent exist, and menstruation does not appear, with a delicate state of health of the patient? There should be a regular course of exercise instituted when the patient can bear it; such as riding on horseback, walking, skipping the rope, &c. The dress should be attended to; and the diet should consist of easily digested food, both animal, and vegetable; all stimulating drinks should be avoided. Tincture of cantharides particularly if leucorrhœa attends may be given in doses of thirty drops three times a day. Keeping the bowels regularly open with aloetic pills with or without the sulphate of iron is beneficial.

What is to be done when a chronic disease exists? Attention should be given to the disease when we have reason to suppose the absence of the menses depends upon it.

What is understood by suppression of the menses? It is the want of return of this discharge at the accustomed period after it has been established, when not interrupted by pregnancy, or suckling.

What are the causes? Cold, applied either in the interval, or during the flow.

What are the symptoms? Paleness, emaciation, debility, nervous symptoms, palpitation of the heart, difficulty of breathing, and a disturbance of the circulation, to which may be added fluor albus, and more or less pain in the loins and pelvis.

What is the treatment? It will depend upon the state of the circulation; if the pulse is disturbed we should prescribe blood letting, purging, low diet, &c., until it is corrected; and then we can safely give emmenagogues; among these aloetic and ferruginous pills, and the ammoniated tincture of guiacum stand first.

What is understood by dysmenorrhœa? It is a menstruous

discharge accompanied by pain of a forcing and bearing down kind, and a discharge of a membranous substance or coagula.

What is the treatment? During the paroxysms the pain should be relieved by anodynes, and antispasmodics, such as camphor, and camphor and opium, with perfect rest. In the intervals use alteratives and tonics after proper depletton.

Pregnancy.

What changes take place after the period of impregnation? The ovum increases in size and is prominent on the ovarium, absorption of its peritoneal coat takes place, it is embraced by the fimbriated extremity of the fallopian tube, and carried towards the cavity of the uterus.

At what time is the ovum found in the uterus? About twenty days after impregnation.

What is the appearance of the ovarium after the ovum is removed? First an effusion of blood into the cavity from whence the ovum was removed, and this is followed by a corpus luteum.

The Membranes.

What takes place during this time in the cavity of the uterus? The internal surface throws out a vascular tissue which is termed the membrana decidua; it lines the cavity of the uterus down to the internal os uteri, remains next to it during pregnancy, and forms the medium of contact between the uterus and the ovum.

What are the membranes of the ovum? There are two; the chorion externally, and the amnion internally. They enclose the embryo and the water in which it floats.

What takes place when the ovum arrives at the uterus? The ovum adheres to the decidua and causes a growth of that part with which it comes in contact, and is called the decidua reflexa; so that the decidua is then divided into that portion lining and in contact with the uterus called decidua vera; and that portion in contact with the ovum, and called decidua reflexa; this arrangement corresponds with that of the pleura pulmonalis and costalis; they come in contact about the fourth month.

What are the uses of the amnion and chorion? The am-

nion furnishes a quantity of fluid for the protection of its contents; the chorion furnishes a means of communication with the uterus, and is thought by some to form the basis of the placenta.

What then does the ovum consist of after its establishment within the uterus? The decidua, decidua reflexa, chorion, amnion, liquor amnii, fœtus, and umbilical cord, with one extremity attached to the umbilicus of the child, and the other to the membranes, which for the present answers the purpose of the placenta.

What are the uses of the liquor amnii? Perhaps its uses are not entirely known; but it allows space, and facilities for motion, development, &c., of the fœtus.

What composes the umbilical cord? It consists of two arteries, a vein, a layer of amnion, and perhaps also of the chorion; the arteries are a continuation of the primitive iliacs; the vein passes under the edge of the liver, and enters the vena cava.

The Placenta.

What is the placenta and its characteristics? It is that vascular mass by which the circulation is maintained between mother and child, and the latter is nourished. Its diameter is six or eight inches, and its thickness is from a few lines at its edge to one inch or more at its centre. It has two surfaces; the uterine which is rough, spongy, traversed by sulci, and it is believed by many that the decidua lines its whole surface; and the fœtal which is smooth, and lined by the amnion.

What kind of communication exists between the uterus and placenta? It is by capillary veins and arteries.

Suppose an injection passed into the umbilical arteries what becomes of it? It passes into the veins of the placenta, and the whole plexus may be filled. The arteries may be filled in the same manner by injecting the umbilical vein.

What is meant by embryo? It is the new being during the first three months of gestation; the balance of its intrauterine existence it called fœtus.

The Fœtal Circulation.

What are the peculiarties of the circulatory apparatus of the fœtus? There are five: 1st. The vena umbilicalis. 2d.

The ductus venosus. 3d. The foramen ovale. 4th. The ductus ateriosus. 5th. The arteriæ umbilicales.

What is the vena umbilicalis? It arises from the placenta, enters the abdomen through the naval, passes along the anterior margin of the suspensory ligament of the liver, is connected with the sinus of the vena portarum, and a great portion of its blood is distributed to the liver.

What is the ductus venosus? It arises from the vena portarum, and empties into the left hepatic vein near its junction with the vena cava; it arises directly in face of the umbilical vein, so that a probe may pass readily from one to the other.

What is the foramen ovale? It is a large aperture between the two auricles of the heart, furnished with a valve, which closes when respiration begins.

What is the ductus arteriosus? It is a canal leading from the pulmonary artery into the aorta, and discharges into the aorta at the lower part of the curvature.

What are the arteria umbilicales? They are two in number, and are a continuation of the external iliacs; they pass through the navel in company with the umbilical vein, twist spirally around it, and are distributed to the placenta.

What is the course of the fœtal circulation? It is from the placenta through the umbilical vein and ductus venosus into the ascending cava, which discharges the blood into the right auricle of the heart. The eustachian valve turns the greater part of the blood into the left auricle, through the foramen ovale. The left auricle may then be said to be distended with blood from the ascending cava, while the right is distended with the blood of the descending cava. The auricles contract together and fill the ventricles. The ventricles also contract together, and fill the pulmonary artery and aorta. The blood of the right ventricle having got into the pulmonary artery is principally discharged by the ductus arteriosus into the descending aorta. That of the left side by being driven into the aorta is mostly sent through the arteria innominata, the left carotid, and the left subclavian, to the head and upper extremities; what remains being mixed with the contents of the descending aorta, goes to the lower extremities; but by far the greater portion of the blood of the descending aorta passes through the umbilical arteries to the placenta, where it is rendered fit for the nutrition of the fœtus, taken up by the umbilical veins, and repeats the same round until respiration is established.

Changes in the Uterus from Impregnation.

What are the changes which take place in the parietes of the uterus itself from impregnation? There is an increased quantity of blood sent to it which increases with gestation; the vessels from being small and convoluted become enlarged and straighter.

The fibres of the uterus become developed so as to be recognized as muscular; the organ increases in size with perfect regularity, and its position and distension give us a pretty accurate knowledge of the advancement of pregnancy. For the first three or four months the uterus is found lower in the vagina than when unimpregnated; after the fourth or fifth month the fundus can be felt at the pubic region; at the sixth half way between it and the umbilicus; at the seventh at the umbilicus; at the eighth half way between the umbilicus and the scrobiculus cordis; at the ninth about the same owing to the more perfect development of the neck. The neck of the uterus undergoes changes also after the sixth month; it becomes shorter and shorter, and at the ninth month it is entirely obliterated; furnishing then the principal increase of space for the fœtus. Of the body and fundus, the posterior portions contribute the most space, and hence the fallopian tubes at the latter part of pregnancy are found in advance of the uterus.

Of the developement of the Fœtus.

In what order is the product of conception developed?

To the fifteenth day it is a gelatinous, semitransparent, flocculent, greyish mass; at thirty days it is the size of a large ant, varying from three to five lines in length; at six weeks it is ten lines in length, about the size of a bee, and some of the rudiments of organs are visible; at two months it is about two inches long, the weight is two ounces, and ossification has commenced in some parts; at the third month it is about three and a half inches long and weighs nearly three ounces, the umbilical cord is formed, and the genital organs are distinct; at the fourth month it is from five to six inches long, and weighs from four to five ounces.

During the fifth month motion is perceptible by the mother, the length is from seven to nine inches, and the weight nine or ten ounces; at the sixth month the parts are

more perfectly developed, it weighs from one to two pounds, and its length is from nine to twelve inches.

At the seventh month all parts are more perfectly developed; the eye lids which until now have been united by the membrana pupillaris are separated; the hair and nails grow, the weight is from two to three pounds, and the length is from twelve to fourteen inches. At eight months the weight is from three to five pounds, the length sixteen inches or more, and all the parts show a much more perfect condition of developement. At the ninth month the head has considerable firmness, ossification is more complete, all the organs are capable of performing their appropriate functions in a more perfect manner; the length of the fœtus is about 20 inches and the average weight is about 7 pounds in this country.

Extra-uterine Pregnancy.

What are the varieties of extra-uterine pregnancy? Ovarian pregnancy, or when the embryo is developed in the ovary.

Ventral or abdominal pregnancy, when the embryo becomes deposited and developed in the cavity of the abdomen.

Tubal pregnancy, or when the embryo becomes developed in the tube.

Interstitial pregnancy, or when the ovule becomes deposited between the layers of the muscular fibres of the uterus and is developed.

What are the consequences of extra-uterine pregnancy? The consequences are usually serious; irritation, inflammation, suppuration, ulceration, internal hemorrhage, and sloughing are all liable to happen, and often to the extent of causing death to the mother.

What is the proper treatment? Generally a palliative treatment is the best.

Gastrotomy has been recommended by some authors.

Of the signs of Pregnancy.

How are the signs of pregnancy divided? Into the rational or sympathetic, and the positive or physical signs.

What are the rational signs of pregnancy? Suppression of the menses; the nipples and papilla become enlarged, tumid, dark colored, and surrounded by an areola; morning sickness; enlargement of the abdomen, &c.

Are these signs positive? No; they are all fallacious, and may be produced by other causes than pregnancy.

What is the mode of examination to detect the physical signs? The examination of the abdomen by the hand, by auscultation, and ballottement.

What do we detect by an examination of the abdomen with the hand? The form of the tumour, and the movements of the fœtus.

What may be detected by ausculation? The pulsations of the fœtal heart, and the uterine souffle, and to these may be added the movements of the fœtus.

Is the uterine souffle a sign to be invariably relied upon? No; it is valuable, but not conclusive.

Are the pulsations of the fœtal heart to be relied upon? They are conclusive when heard; which can almost invariably be done when pregnancy exists, after the fourth month, although at this early period great care is required. The point where it may often be heard is about midway between the scrobiculus cordis and symphysis pubis, or perhaps more frequently a little to the left of the middle line. These pulsations may be distinguished by their quickness, which are from 130 to 150 in a minute. In cases of double pregnancy the sound of both fœtal hearts may mostly be heard in the last weeks of pregnancy.

What is meant by ballottement, and what is its importance as a diagnostic of pregnancy? The process of ballottement is performed by passing the finger to the mouth of the uterus, or midway between it and the symphysis pubis, while the other hand is applied upon the abdomen to the fundus; the finger should be suddenly pushed up against the uterus, while the palm of the other hand is placed on the abdomen to receive any impression which such a shock may produce, the finger in the vagina is to be kept applied to the uterus, so that it may determine whether any floating body descends upon it. By these means we can determine whether the uterus contains a floating body, but it does not give us absolute knowledge of what that floating body consists. The woman should be in the erect position.

Are there any other symptoms of pregnancy? Yes; the presence of *kiesteine* in the urine is looked upon as affording a symptom of value, not always to be depended upon however, as it may exist in certain diseases; but taken in con-

nection with other symptoms it may be valuable in coming to a conclusion.

Of the Action of the Uterus

What are the actions of the uterus? It has two. The first tends to reduce it to its original size after having been distended; this is called its tonic action. It is accomplished by all the fibres gathering themselves to a common centre, but particularly by the circular fibres.

The second acts only when attempting to expel something, and is alternate in its action; it has been termed the spasmodic or painful contraction of the uterus; and never takes place unless the tonic action is perfect or nearly so.

Retroversion of the Uterus.

What is meant by retroversion of the uterus? It is where the fundus is precipitated backwards, and places itself between the rectum and bladder; while the neck is mounted up behind the symphysis pubis.

At what time may this displacement take place? Either in the unimpregnated or the impregnated state; but usually in the latter. It occurs mostly between the second and fourth months of pregnancy.

What are the causes? Whatever tends to depress the fundus; such as blows, pressure, sudden exertion, violent efforts to vomit, coughing, an over distended bladder, and an accumulation of fæces in the rectum.

What are the symptoms? When suddenly produced the symptoms may be severe; an immediate interruption to the flow of urine, or to the passage of the fæces, alternate pains, bearing down, disposition to faint, &c. When slowly induced the symptoms are the same only less urgent and severe, but increase in intensity as the uterus is developed, until relieved. The diagnosis should be verified by the touch; and the disease may easily be distinguished by the vagina interposing between the finger and the tumour, the neck being mounted up behind the symphysis, and by its being obstinately fixed in its position.

What is the treatment? The catheter should be used, and the bowels emptied daily; if this plan does not succeed it should be replaced by mechanical means. The plan then to be pursued is to empty the bowels, either by injections or

a cathartic; draw off the urine with an elastic catheter; and bleed to fainting or nearly so. The bed should be prepared in such a manner that the patient may lay upon her back, with the perineum free from the edge of the bed, and the parts should be well lubricated with oil or lard. When faintness is induced by bleeding the woman should be placed in the above position; the fingers should be placed so as to form a straight line at their extremities; they must then be gently pressed against the base of the tumour in the vagina so as to move it backwards and upwards, along the hollow of the sacrum, until it is placed above the projection of this bone; the hand should be withdrawn, a pessary introduced, and the woman kept quiet in bed for some days.

Anteversion of the Uterus.

What is anteversion of the uterus? It is where the fundus is thrown forward and downward, so as to press against the posterior and inferior portion of the bladder, while the neck is carried forwards towards the projection of the sacrum. The symptoms are not as severe as in retroversion. It may generally be relieved by opening the bowels and drawing off the urine.

Of the Obliquities of the Uterus.

How are they divided? Into right and left lateral, and the anterior.

What is the treatment for these displacements of the uterus? Before labor the woman should wear a bandage or supporter.

During labor the axes of the uterus and pelvis should be made to correspond, by placing the patient on the side opposite to the obliquity, and bringing the fundus into its proper place. If this does not accomplish the object the os uteri should be hooked down by the finger, and brought to correspond with the axis of the pelvis.

Of the Term of Utero-gestation.

What is the average term of utero-gestation? About nine calender months or forty weeks.

What is the most favorable period for conception? Immediately after the menstrual evacuation.

Of Labour.

What is understood by the term labour? It is the expulsive efforts of the uterus and mother in evacuating the contents of the uterus.

Is its cause well understood? It cannot be explained in the present state of our knowledge.

Has the mind any influence on labour? Mental impressions may excite labour in some cases, and in others suspend, or prevent it.

Is the fœtus active, or passive during labour? It is entirely passive; being acted upon by the uterus mainly, assisted by the voluntary powers of the mother.

What are the symptoms of labour? They are rigors, and nervous symptoms, frequent inclination to make water, or a suppression of it, tenesmus, the subsidence of the abdominal tumour, secretion of mucus, dilatation of the mouth of the uterus, and its alternate contractions.

By what set of fibres is the os uteri opened? By the longitudinal, which are opposed by the circular.

Into how many stages is labour divided? Three. The first is the period of dilatation of the os uteri sufficient to permit the child to pass, and occupies about ten twelfths of the whole duration of labor.

The second is the period of expulsion of the child from the uterus, and occupies about one ninth.

The third stage includes the complete expulsion of the membranes and placenta, and occupies about one twenty-fourth of the whole duration of labor.

Are the active duties of the accoucheur numerous in a natural labour? No; he should watch with care its progress and attending symptoms, so as to be able to render assistance promptly in case of difficulty; but should not interfere when the case is a natural one. To be able to discriminate where interference is necessary requires an accurate knowledge of a healthy labor, and the deviations to which it may be liable.

What should be the position of the woman during labour? She should be placed on her left side at the foot of the bed in such a manner that she may fix her feet firmly against the bed posts; her hips within ten or twelve inches of the edge of the bed, with the lower extremities flexed, and the head supported by pillows.

The bed should be properly protected by folded blankets from the discharge.

What time would you choose for making an examination of the progress of labour? The finger should be introduced into the vagina during a pain; the examination of the presenting part and of the condition of the os uteri should be made both during pain, and in its absence.

Should the membranes be ruptured during labour? When the membranes remain entire, and the pains are efficient, with the os uteri dilated or dilatable, they should be ruptured by pressing the finger against them, or by cutting them with the nail.

When the head is emerging under the arch of the pubes what are the duties of the accoucheur? He should support the perineal tumour with the palm of the left hand, and retain it there until the head is freed from the vulva.

When the head is in this position is it proper to act upon it, and extract the fœtus? No; the delivery should be trusted to the action of the uterus, unless it should become suspended, and there is danger of the life of the child. By a too sudden delivery alarming hemorrhage may result.

What is the first great object as regards the child after delivery? To establish respiration, which generally takes place spontaneously; if it does not, measures should be taken to produce artificial respiration; and heated cloths should be applied to the child rather than the warm bath.

What are the means employed in producing artificial respiration? The nostrils should be closed, and air forced into the mouth either by the bellows, or from the mouth of the accoucheur; and again expelled by gently pressing upon the thorax.

To what period after birth may respiration be suspended and yet the child live? For thirty, or even forty minutes in some instances; so that our efforts should be continued so long as there is any chance of life.

At what time is it proper to put a ligature on the cord, and cut it? When the child cries, or respires freely; and there is evidence of a proper supply of arterial blood.

How many ligatures are necessary? One; except there be twins, in which case two are necessary.

After the child is separated from the mother and given to the nurse what should then be attended to? The condition of the uterus should be ascertained by examining it through

the parieties of the abdomen; when it will either be found contracted or relaxed.

If contracted the placenta may be in the vagina, and easily hooked down with the fingers and drawn by the cord; when it has passed the os externum it should be grasped and twisted several times round, so that the membranes may be entirely withdrawn.

If the uterus is relaxed frictions should be made over the abdomen so as to produce contraction.

The condition of the uterus should be watched until its permanent tonic contraction is well established.

What is understood by putting the patient to bed? It consists in the removal of wet things and substituting dry ones; in being lifted where she is permanently to lie; and in the application of a bandage over the abdomen.

At what time should it be done? If she is not in a profuse perspiration, is not liable to, or has no hemorrhage, or not much exhausted, it should be done immediately.

Upon what does after pains depend and what is the remedy? After pains are produced by coagula in the uterus, which are caused by a deficiency of its tonic contraction.—The proper remedies are camphor, opium and its preparations, and the extract of hyosciamus.

What should be the diet of a woman after delivery? Gruel of oat meal, tapioca, sago, mush and milk, rice, weak tea, coffee, and chocolate. Animal food, spirits, wine, cordials, and all stimulating articles should be strictly avoided. After the first week she may be allowed some oysters, eggs, beef tea, &c.

When should the child be put to the breast? If there is danger from hemorrhage it should be applied as soon as possible; and at any rate as soon as it can be done conveniently without too much annoyance to the woman.

If the bowels should be confined, at what time would it be proper to give a cathartic? On the third day; previous to this, unless there is some particular indication to fulfil the bowels should not be disturbed.

The state of the bladder should also always be attended to.

What is meant by the lochia? The discharges which take place from the uterus after delivery.

Is it necessary to administer purgatives to young children? It is necessary that the bowels should be thorough-

ly cleansed of the meconium, either by their natural action, or by some laxative as molasses or castor oil; but so soon as there is a change of color produced in the evacuations they should be discontinued.

The condition of the bladder of the child should also be attended to, and relieved if urine should accumulate in it.

Is it proper to feed very young children? Provided the mother does not furnish a supply of milk sufficient, but not otherwise; the child may have a little fresh cows milk diluted with one third water, and sweetened with loaf sugar.

Of Natural or Unassisted Labour.

What is meant by a natural labour? Every labour may be considered natural, in which the woman might be delivered without help.

What conditions should exist that natural labour may take place? There should be regular contractions of the uterus, a favorable presentation, the pelvis of a proper size, a proportionate head, and the soft parts relaxed.

What are considered to be the natural presentations? There are four; 1st. of the head—2d. of the feet—3d. of the knees—and 4th. of the breech.

Of these which is the most frequent, and the most favorable? The presentations of the head.

How are presentations of the head divided? There are six.

What are their positions, and how are they distinguished? The first, which is known by the posterior fontanelle being behind the left acetabulum, and the anterior before the right sacro-iliac symphysis.

The second, distinguished by the posterior fontanelle being behind the right acetabulum, and the anterior before the left sacro-iliac symphysis.

The third, distinguished by the posterior fontanelle being behind the symphysis pubis, and the anterior before the projection of the sacrum.

The fourth, distinguished by the anterior fontanelle being behind the left acetabulum, and the posterior before the right sacro-iliac symphysis.

The fifth, distinguished by the anterior fontanelle being behind the right acetabulum, and the posterior before the right sacro-iliac symphysis.

And the sixth is the reverse of the third.

To remember these presentations easily, notice that the 1st. 2d. and 3d. presentations are represented by the posterior fontanelle; and the 4th. 5th. and 6th. by the anterior fontanelle; and that we constantly follow their numerical order, commencing with the left acetabulum, then with the right, and go to the symphysis pubis; each fontanelle following the same rout and order.

What are the distinguishing marks of the presentation of the head? Its roundness, firmness, sutures, and fontanelles.

The particular position of the head relatively to the pelvis is determined by the situation of the sutures, and fontanelles.

Mechanism of Labour.

What is the mechanism of the first presentation? The head enters the superior strait obliquely in the position described in the first presentation.

The head is flexed with the chin on the breast, and descends in this position in the axis of the superior strait.—When it arrives at the sacro-sciatic ligaments rotation is performed by the head of 1-6 of a circle, while the body remains in the same position; the centre of the occipital bone will then be found to correspond with the symphysis pubis, and the sagittal suture with the antero-posterior diameter of the pelvis. As the head advances the chin departs from the breast, the vertex advances, separates the external parts, rises up towards the mons veneris, and describes about a quarter of a circle backwards; this motion is called extension, and may be considered perfect just as the face is clearing the perineum. As soon as the head has escaped externally it takes a position at right angles with the shoulders, or its natural position in relation to them; this is called restitution. In these motions it will be seen that the small diameters of the head correspond with the small diameters of the pelvis; and that it executes four motions, that of flexion, rotation, extension, and restitution.

Which shoulder presents at the symphysis pubis in this presentation? The right shoulder.

What is the mechanism of the second presentation? It is the same as the first, if we place the head in the position of the second presentation at the superior strait; and the left shoulder passes out under the arch of the pubes.

What is the mechanism of the third presentation? In the

third position the head is presented at the superior strait with its longitudinal diameter corresponding with the antero-posterior diameter of the pelvis; it descends in this manner and performs the motions of flexion, and extension, but not those of rotation, and restitution.

Which shoulder presents to the symphysis in this presentation? There is no certainty whether it will be the right or left.

What is the mechanism of the fourth position? The head presenting with the anterior fontanelle at the left acetabulum descends until a portion of the right parietal bone rests upon the inferior part of the sacrum when rotation takes place, and the forehead is placed under the arch of the pubes; the anterior fontanelle will be found in the middle of the arch; the posterior above the point of the sacrum; the occiput continues to advance over the coccyx and perineum until it is cleared from it; the occiput then turns backwards towards the anus of the mother, and the face disengages itself from under the pubes.

Which shoulder presents to the arch of the pubes? The left.

To what position may this be changed with advantage? To the second; and the fifth may be reduced to the first.

How is this accomplished? The uterus must be well dilated, the membranes ruptured, the head occupying the lower strait, and the labor active. The point of the fore-finger must be placed against the edge of the sagittal suture, before or behind the anterior fontanelle; in the absence of pain press the part towards the left sacro-iliac symphysis, maintain it there during the next pain, and this must be repeated again and again until we succeed.

What is the mechanism of the fifth presentation? The relations of the childs head to the pelvis are the same as in the fourth, only the anterior fontanelle at the superior strait is placed at the right acetabulum; and the right shoulder presents at the arch of the pubes.

What is the mechanism of the sixth presentation? This presentation is the reverse of the third; and in addition to the great diameter of the head being parallel with the small diameter of the upper strait, the forehead has to come under the arch of the pubes so that the first part of the labour resembles cases of the third presentation; and the latter part cases of the fourth, or fifth.

Presentation of the Breech.

What is the order of frequency of the natural presentations? The breech is next in frequency to the head; then the feet and knees.

What is the principal danger in these cases where the body of the child is first delivered? It arises from delay in delivery of the head, and compression of the umbilical cord; consequently breech presentations from the perfect manner which the external parts are dilated, preparatory to the passage of the head, are less dangerous than the feet and knee presentations, although it may be a little more tedious to the mother.

What are the symptoms of a breech presentation? It may be known by the soft tumour wanting the characteristics of the head; having neither its sutures, hardness, or roughness. A deep grove is observed leading to the anus and parts of generation, and after the rupture of the membranes a discharge of meconium will corroborate, but not positively confirm the diagnosis.

What are the varieties of breech presentations? There are four. In the first the lower part of the spine and sacrum offer to the left acetabulum, and the abdomen looks towards the right sacro-iliac symphysis.

In the second the back of the child answers to the right acetabulum, and the belly to the left sacro-iliac junction.

In the third the spine is behind the symphysis pubis, and the belly towards the projection of the sacrum.

The fourth is the reverse of this last.

What is the proper management of cases of breech presentation? It is not to interfere unless complicated with some circumstances which may render it necessary.

Presentation of the Feet.

What are the characteristics of feet presentations? They are easily told by the projecting heels; the short toes, and from the hands to which alone they bear any analogy by the absence of the thumb?

What are the presentations of the feet? There are four. In the first the heels are anterior to the left acetabulum, and the toes are directed towards the right sacro-iliac symphysis. In all these cases the legs are flexed upon the thighs, and the thighs on the pelvis.

In the second the heels are behind the right acetabulum, and the toes look toward the left sacro-iliac symphysis; in all these cases the other parts of the body correspond to the position of the feet.

In the third the heels are at the symphysis pubis, and the toes to the sacrum.

In the fourth the position is reversed, the heels are to the sacrum, and the toes to the pubes.

Presentation of the Knees.

What are the presentations of the knees? There are four. In the first the legs are to the left side of the mother and the thighs to the right.

In the second the legs are to the right, and the thighs to the left.

In the third the legs are under the arch of the pubes, and the thighs towards the sacrum.

The fourth is the reverse of the third.

Of Labors in which the presentation is natural, but rendered difficult or preternatural.

What are the causes which may render a natural labor preternatural? They are 1st. flooding: 2d. convulsions: 3d. syncope: 4th. hernia: 5th. obliquity of the uterus: 6th. partial contractions of the uterus: 7th. compound pregnancy: 8th. descent of the cord: 9th. too short a cord: 10th. bad position of the head: 11th. exhaustion: 12th. hemorrhages from the lungs, or other organs.

Flooding as a complication of Natural Labor.

Under what conditions of the os uteri may hemorrhage take place during labor? It may be either partially dilated and rigid; or it may be dilated, or easily dilatable.

What should be the treatment when the os-uteri is rigid? There should be no hasty or rash interference, and it would be the height of imprudence to enter the uterus and attempt turning. The discharge should be controlled by rest, a horizontal posture, by blood-letting if indicated, large doses of acetate of lead, cold applications, and the tampon. In some cases when the above means fail, benefit may be derived from promoting the contractions of the uterus by rupturing the membranes.

What should be the treatment when the os-uteri is dilated or dilatable? We should at once proceed to turning, unless rupturing the membranes should abate the discharge, or the activity of labor promise a speedy delivery. If the labor is far advanced the forceps may be necessary.

Convulsions.

What course should be pursued in convulsions as regards delivery? If the os-uteri is rigid delivery should not be attempted, blood-letting, cathartics, and such other means as may be called for should be resorted to, until the uterus becomes relaxed; when we may proceed to turn, unless the natural powers of the uterus are sufficient to accomplish a delivery.

When the uterus is dilated or easily dilatable we should at once proceed to turning, after a copious blood-letting.—In cases where the waters have been long drained off, and the head low in the pelvis, we should use the forceps.

Syncope

What course should be pursued in cases complicated with syncope? The cause should at once be sought out, and if it depends upon a peculiarity of the nervous system little need be done. But if it proceed from internal or concealed hemorrhage we should deliver immediately, unless the state of the os uteri prevent.

Hernia.

When a hernia is in danger of becoming strangulated what course should be adopted? Turning, if the os uteri is in a proper condition.

Bad Position of the Head.

What may be considered bad positions of the head, particularly when the head is relatively large, or the pelvis relatively small? When the head presents at the superior strait as in the third and sixth presentations.

When the chin departs from the breast too early.

When the face presents from excessive departure of the chin from the breast.

And when some part as the hand or arm accompanies the head.

What is the remedy for the first of these difficulties?

The head shall be grasped so that the thumb may lay on one side, and the fingers on the other; it shall then be raised, and in the third presentation the vertex shall be turned towards one of the acetabula; if the right hand be used turn it towards the right acetabulum, and if the left towards the left acetabulum; then trust to nature. The sixth presentation should be changed either to the fourth or the fifth, which will be as much rotation as the neck will bear.

What is the remedy for too early departure of the chin from the breast? It is to restore it by pushing up the forehead in the absence of pain, and retain it there with the points of two or three fingers until a pain comes on, and the vertex is found to descend; it may then be trusted to nature.

What are the varieties of face presentations? There are four; in the 1st the forehead offers to the left, and the chin to the right side of the pelvis; the 2d. is the reverse of this; in the 3d. the forehead answers to the symphysis of the pubes, and the chin to the sacrum; the 4th. is the reverse of this.

How may face presentations be distinguished? By the presence of the eyes, nose, mouth and chin.

At what period, and how may they be remedied? When the uterus is dilated or dilatable, and the head has not passed the superior strait; with the waters recently expended. Pass the hand which is on the side on which the vertex and forehead are placed; in the first and second presentations, put the the back of the fingers to the posterior part of the pelvis, and place them on the side of the head, while the thumb is placed against the opposite side; the head is then to be raised, the fingers carried over the vertex, and the thumb to the forehead; while the fingers are made to draw the vertex downwards the thumb is to press the forehead upwards. This is to be done in the absence of pain, and retained until a pain comes on, and the head takes the proper direction.

In the third and fourth presentations turning is the proper remedy when the condition of the uterus will admit it.

What is the proper remedy when the hand presents with the head? It should be prevented from descending by placing the point of the fore finger between the fingers of the child, and supporting it during a pain, at the same time directing it towards the face; as the head descends the hand

may in this way be made to retire within the cavity of the uterus.

What is the remedy in the other cases of complication of a natural labor requiring interference? Turning, when the condition of the os uteri will admit of it; but in no case is the uterus to be entered unless the os uteri is either dilated or easily dilatable. The forceps should be used when the head is low in the pelvis.

What is the proper position of a woman for turning? The back is the best; with the lower extremities over the edge of the bed, and the feet resting on chairs, so as to leave the perineum and coccyx free.

What time should be chosen for the introduction of the hand, and how should it be done? It should be formed into a cone, with the thumb looking towards the symphysis pubis, and introduced into the vagina during a pain, and into the uterus during its absence.

Is it proper to turn a child after it has passed the os uteri? No; it should be done as soon as possible after the first stage of labor is completed.

When the hand is in the uterus to what part should it be passed? The hand should grasp the head with the fingers on one side and the thumb on the other, raise it in the axis of the superior strait, and place it in the iliac fossa towards which the palm of the hand looks; where it must be retained by the wrist and forearm, while the fingers trace the side of the child to the feet, which should be grasped firmly and both acted upon at the same time when practicable.

In what direction should the feet be conducted when bringing them down? So that the toes should always look towards the abdomen of the child.

Is it proper to attempt to turn a child during a pain? No; the uterus might be lacerated.

Is it proper to complete the delivery in cases of turning, or bring down the feet and permit the natural powers to finish? When commenced it should be completed slowly and steadily.

When the feet are brought through the external parts what should be their position? The toes should look towards the anus of the mother; and when it is delivered beyond the umbilicus it should be made to pass through the arch of the pubes with its spine looking towards, or pressing against either the right or left leg of the pubes, that the head may enter the superior strait obliquely.

When the axillæ appear at the os externum what should be done? The one next the sacrum should be first delivered, by passing a finger or two upon the point of the shoulder and pressing it downwards, tracing the arm to the elbow which may be pressed upon downwards and forwards towards the face of the child, where it will almost always be disengaged. To deliver the second arm, turn the shoulder of that arm to that side of the pelvis to which the face of the child looks; and it will instantly become disengaged from the head at the small diameter of the superior strait, and may be brought down in the same manner as the first.

When the child is all delivered except the head what should then be attended to? The position should first be ascertained; and if it does not already exist, a proper relation should be established between the diameters of the pelvis and the head of the child; a little force should now be applied in the direction of the axis of the superior strait. When in the inferior strait the proper relations should again be established between the diameters of the head and this part of the pelvis.

The mother should now be directed to assist by her voluntary powers, and the child may be acted upon in the direction of the axis of the inferior strait, while we press against the occiput in such manner as will tend to disengage it from behind the pubes.

What are the dangers arising from deliveries of this kind? Compression of the cord, compression of the head and chest, and extension of the neck. To obviate the last difficulty we should co-operate with the pains of the mother when they exist, and the whole should be conducted coolly and deliberately.

Which hand should be employed in cases of turning? Always use that hand which will look towards the face of the child. In the first presentation it will be the left hand; in the second the right; and for the third and sixth either hand will be proper, or the one of which we have the greatest command.

Of the Forceps.

What kind of forceps are generally used? There are two; the short, and the long.

The short are preferred when the head is very low in the pelvis, and the long when high up. The long forceps are

however better adapted to both conditions, and should on the whole be preferred.

What do the forceps resemble, and when are they indicated? They may be compared to a pair of artificial hands; and are indicated when the powers of the uterus cannot accomplish delivery, when the case is complicated requiring immediate delivery, and the head passed the os uteri. They are, however, sometimes applied at the commencement of the second stage of labour, but it should only be attempted when turning is practicable, by a person well skilled in their use.

What is the best position of the woman for the application of the forceps? The one recommended for turning.

Should the condition of the bladder and rectum be attended to? They should both be emptied before the forceps are used; the external parts, and the instrumets should also be coated with hogs lard.

What should be the condition of the os uteri, and membranes? The os uteri and external parts should be relaxed, and the membranes ruptured.

To what parts of the head should the blades of the forceps be applied? To the sides of the head over the ears of the child in the direction of its oblique diameter; and so that their concave edges will come under the arch of the pubes at the last period of labour.

In cases of difficulty in causing the handles of the instrument to join should they be brought together by force? No; the cause of their not locking must be ascertained, and remedied; force should never be used.

What are the modes of action of the forceps? They have two modes of action; that of compression, and that of traction and compression.

May the life of the child be destroyed by compression from the use of the forceps? It may; care should be taken in this respect, and after each tractive effort the forceps should be permitted to expand themselves.

In what manner should traction be made? It should be made from blade to blade, so that each may act as a lever upon the head.

The extent of this motion of the handles must be governed by the distance of the head from the external parts; the less the head is advanced the more circumscribed should be the motion, and the reverse. The general direction of this

traction should correspond with the axis of that part of the pelvis through which the child is passing.

Should a labor be completed by the forceps in all cases where their application is necessary? They may be removed when the head has nearly passed through the external parts, provided the pains continue, but not otherwise.

Of Locked or Impacted Head.

What are the varieties of locked head? There are two:

1st. Where the head is jammed with its greatest length between the pubes and sacrum.

2d. Where its thickness cannot pass owing to the narrowness of the pelvis.

In the first place the points of pressure are the forehead and occiput, and in the second it is the parietal protuberances.

What are the causes? Long continued and vehement action of the uterus, and a disproportion between the diameters of the pelvis and head; either from malposition of the head, its size and solidity, or from deformity of the pelvis.

What are the attending symptoms of a locked head? Immobility, accompanied by swelling of the hairy scalp of the child, thickening of the os uteri, a swelling of the vagina and external parts.

What are the dangers? The mother is exposed to inflammation, sloughing, and gangrene, and the child to almost certain death.

What are the indications? The delivery of the child; which should be effected by the forceps if the child is living, and if dead the crotchet may be employed.

Uterine Hemorrhage.

How is uterine hemorrhage divided? Into the accidental, and the unavoidable.

What is meant by accidental hemorrhage? It is that which occurs at any period of pregnancy from a detachment of the placenta, when situated at the body, or fundus of the uterus.

What is meant by unavoidable hemorrhage? It is that which occurs from the situation of the placenta over the mouth of the uterus.

Accidental Hemorrhage.

At what period of pregnancy may accidental hemorrhage take place? At any time after the first month.

What is the period of the greatest danger? As a general rule it is in proportion to the advancement of pregnancy.

What is the division of accidental hemorrhage for practical purposes? There are four divisions.

1st. Hemorrhage which occurs at the period when the ovum is entirely surrounded by the decidua, and decidua reflexa; comprehending the first four or four and a half months of pregnancy.

2d. That which occurs during the remaining period of utero-gestation.

3d. That which occurs between the birth of the child, and the expulsion of the placenta.

4th. That which occurs subsequent to the expulsion of the placenta.

What are the attachments of the ovum during the first period? It is attached to the parieties of the uterus at all points of its surface; and when separated entire resembles an ovular, spongy, fleshy mass. Hemorrhage may occur therefore from its separation at any part.

What is the condition of the neck of the uterus indicating abortion? When it becomes distended so as to resemble in feel the extremity of an egg, abortion will take place most certainly.

The cessation of morning sickness, a diminution of the abdominal tumour, the painful distention of the mammæ with milk followed by flaccid breasts, also, almost certainly indicate that abortion will take place. Neither pain, or flooding are positive symptoms that abortion will follow.

What are the indications in the treatment during this period? To arrest the bleeding, subdue pain if present, and prevent a recurrence of the hemorrhage.

By what means may these be accomplished? By perfect rest of body and mind; the bed should be a mattrass, or sacking bottom. Feather beds should be avoided. The room should be ventilated, the patient thinly covered, the drinks cold, and every thing of a stimulating nature entirely prohibited, either for food or drink.

Bloodletting may be used or not, according as it may or may not be indicated by the force of the arterial system.

Acetate of lead should be given in doses of two or three grains guarded with opium every half hour, or twenty or thirty grains with a drachm of laudanum dissolved in a gill of water or starch may be used as an enema, and repeated if indicated.

If pain exist opium should be given so as to create a decided impression upon the uterus, or else proves itself unavailing.

Ice water may be applied to the pubes when the discharge is profuse, but our greatest reliance should be on the tampon; the best of which is a fine sponge of sufficient size to fill the vagina.

In all cases where the hemorrhage is alarming whether there is a certainty that abortion will take place or not, we should use the proper means for arresting it, and the tampon will almost certainly do it.

At what period may the ovum be pierced for the purpose of arresting hemorrhage? Never before the fifth month—and when it is ruptured before this period the treatment of the case is more tedious from the retention of the placenta.

When the ovum or placenta is partially expelled, and hemorrhage is kept up by their presence what course should be adopted? It should be removed by the finger, Dewees' hook, or by forceps invented for this purpose.

Sometimes ergot will act efficiently in removing them, and may be given when the hemorrhage is not violent.

What are the indications in the treatment during the second period? They are the same as for the first.

The same rules and treatment should be put in practice at once, and the tampon used early.

Suppose these means fail what should be done? We should rupture the membranes, and proceed to deliver if necessary, provided the os uteri is in a proper condition; when it is not we should rely upon the tampon until it becomes so.

In what other condition would it be improper to effect delivery? When the woman is reduced to the last extremity of weakness, and the discharge suspended; but if it continue it is the only chance remaining.

What are the limits of the beneficial application of cold? When it has controlled arterial action, and perhaps produced some contractions of the uterus; these being accomplished little benefit can be derived from its continuance.

What are the modes of delivery to be resorted to? Turning, and the use of the forceps under the restrictions heretofore mentioned.

Can hemorrhage take place after delivery without a separation of a part or the whole of the placenta? It cannot.

What are the immediate causes of this kind of hemorrhage? A separation of the placenta, and atony or imperfect tonic contractions of the uterus.

What are the varieties? It may be external, or internal and concealed.

What are the symptoms of concealed hemorrhage?

There is a flaccid condition of the uterus, except of the neck which is contracted; it becomes enlarged, and may even equal the size which it had before labor; the effects of the loss of blood are also soon exhibited, unless the hemorrhage is checked.

What are the means used for hemorrhage after delivery? The contractions of the uterus should be excited, and continued. Friction with the tips of the fingers over the fundus will generally produce it, but if it swell we should grasp it with a sudden but moderate force. While these measures are pursuing a dose of ergot should be given, which will not only contribute to the expulsion of the placenta, but will also ensure its contractions afterwards.

If the hemorrhage still continue profuse, and the placenta retained the hand should be introduced, and the placenta removed; the excitement of this process will have a tendency to produce a permanent contraction. The sudden application of cold frequently repeated also has a beneficial effect in this way, applied either by wet cloths, by a douche on the abdomen, or as an injection into the uterus. Firm, steady, pressure over the uterus, but above all the application of the child to the breast will almost always bring about permanent tonic contraction; upon which alone the safety of the woman depends.

What means may be adopted before delivery to prevent hemorrhage in women subject to it. By evacuating the waters, and diminishing the force of the circulation by making the woman preserve a horizontal position, and by the interdiction of stimuli of every kind.

What are the symptoms of encysted placenta from hour-glass contraction? It may be known by the fundus of the uterus reaching higher than common, by being smaller in

its transverse diameter; by an elastic feel of the cord; by the absence of pain, by the placenta not being within reach of the finger; when the hand is introduced the cord is found to pass through a small aperture, and the placenta is felt lying within the cavity formed by this contraction.

What is the treatment? As soon as discovered the woman should be placed in the position for turning, the hand introduced into the vagina, and then passed along the cord until an entrance is gradually effected through the stricture; the mass should then be separated if adherent, and brought away by a gentle, cautious, motion of the hand.

Unavoidable Hemorrhage.

At what period of utero-gestation may unavoidable hemorrhage occur? It generally occurs first between the sixth and seventh month, and gives us the first knowledge of the situation of the placenta over the mouth of the uterus.

Why does it not occur earlier? Because the neck of the uterus is not unfolded before this period; therefore the placenta is not disturbed, or separated. It does not necessarily follow at this time, or before labor commences, but the patient is unavoidably liable from the mechanism of the expansion of the neck of the uterus.

What are the symptoms of unavoidable hemorrhage? When the full time arrives hemorrhage comes on suddenly, and often alarmingly without pain; or if attended with pain it is increased at every pain. This should lead us to suspect a placental presentation or *placenta prævia*. The hand should be passed into the vagina, and the finger into the os uteri, where the placenta may be distinguished by its firmness and fibrous structure from a coagulum; to which alone it bears any resemblance.

What is the treatment? In slight cases at the early periods of pregnancy the ordinary treatment of hemorrhage may be sufficient; but when profuse, and having ascertained it to be a placental presentation, the condition of the mouth of the uterus should be ascertained If it is rigid we should use those temporizing means adapted to the case, among which the tampon stands first; and if it is dilated or dilatable recourse should be had to turning, subject to the rules formerly mentioned. The membranes should be preserved entire; the hand should be insinuated between the os uteri

and placenta, at the part where the separation has taken place; then passed up between the uterus and membranes before rupturing them. They may then be ruptured, the feet seized, and the child delivered; this operation should however be performed with the greatest care.

Of Puerperal Convulsions.

At what period of utero-gestation may a woman be attacked with puerperal convulsions? At any period, but more particularly after the sixth month.

How are puerperal convulsions divided? They are divided into the epileptic, the apoplectic and the hysterical.

Do convulsions take place suddenly or are they preceded by premonitory symptoms. They are generally preceded by premonitory symptoms.

What are the premonitory symptoms? In the epileptic and apoplectic species they are a strong determination of blood to the head, producing headache, ringing in the ears, temporary loss of reason, giddiness, &c.

What is the proper treatment for this stage? Blood-letting, brisk purging, and low diet; which will generally prevent an attack. The longer the premonitory symptoms exist the milder will be the attack; the cases which are attacked very suddenly are generally fatal.

What are the symptoms of the epileptic variety? After a longer or shorter continuance of the premonitory symptoms the woman may be seized with quickly repeated spasms, violent agitation of the face, eyes, and the whole body. The face becomes flushed, livid, black, and the tongue is thrust between the teeth. The respiration is disturbed or suspended, the carotids beat violently, and froth issues from the mouth. The pulse in the beginning is full, frequent, and tense, but becomes rapid, small, and imperceptible, a cold, clammy sweat appears, and the fit begins to decline. When the spasm goes off the patient generally remains comatose and insensible, with stertorous breathing.

These paroxysms may follow each other in quick succession.

There is also a variety of epileptic convulsions which are called anæmic, proceeding from a very different condition of the system, and may be distinguished from the above by the pale face, glazy eye, shrunken features, colorless lip, cold moist skin, and other symptoms indicating a collapsed condition of the system.

The treatment in these cases should of course be of a directly different kind.

What are the symptoms of the apoplectic variety? The premonitory symptoms are of shorter duration than the epileptic, and those following are more violent. It may be considered as an exalted degree of the epileptic.

What are the symptoms of the hysterical variety? We have not the same premonitory symptoms as we have in the epileptic; but we may have ringing in the ears, palpitation of the heart, *globus hystericus*, &c. The convulsions are not so violent, the face is less flushed, and the muscles on the posterior part of the body are generally violently contracted. This last circumstance is considered by Dr. Dewees as strongly characteristic of this variety of convulsions. It also attacks women of delicate and nervous habits.

What is the proper treatment in the epileptic and apoplectic varieties? Bleeding should at once be had recourse to from a large orifice, and repeated as circumstances may indicate. Cathartics and purgative enemata should be given, cold applied to the head, and blisters or sinapisms to the extremities. Whenever the os uteri is in a proper condition we may finish the labor if it have commenced, by turning or the forceps; our choice depending upon the stage of labor, and the circumstances regulating the application of each.

What is the treatment for the hysterical variety? A moderate bleeding in most instances, followed by tincture of assafœtida and laudanum, cold dash, &c.

Of Inversion of the Uterus.

What is meant by inversion of the uterus? It is where the fundus is forced down into the cavity of the uterus, and through the os uteri into the vagina, or where the whole uterus is turned inside outwards, and the fundus appearing at the os externum. The former is termed partial and the latter complete inversion.

Under what circumstances may inversion of the uterus take place? In certain cases of polypus and immediately after delivery.

What are the causes? Any force applied to the fundus whether by the cord or externally, immediately after having been emptied suddenly, violent straining, attempts at cough-

ing, sneezing, or by any sudden action of the abdominal muscles.

How may an inversion be distinguished? In the partial it may be known by the absence of the hard spherical tumour of the fundus above the pubes, and by the presence of a globular fleshy body in the os uteri, which is sensible to the touch.

The patient complains of a dragging sensation in the groins and lumbar region, compelling her to strain violently; there is hemorrhage, an oppressive sense of sinking, with nausea or vomiting, cold sweats, faintings, and often convulsions.

In the complete the hemorrhage and violent pain are absent; although death may suddenly follow from the shock received by the nervous system, or from fainting.

What is the treatment? It should be returned immediately, and the difficulty of doing this will be in proportion to the time elapsed from the accident. When the placenta is adherent there is a difference of opinion whether we should remove it or return it with the uterus, and allow it to be thrown off afterwards by the contractions of this organ. In cases of complete inversion the better practice is to separate it, as there is comparatively little danger from hemorrhage.

In the partial perhaps it would be better to attempt to replace the uterus with the placenta, but if it offer much resistence and delay to the reduction, it should be at once removed.

What is the manner of reduction? The tumour should be firmly grasped and pushed up bodily in the direction of the axis of the os uteri; and we should endeavor first to return that portion of the uterus which was expelled last from the os uteri; when it has ascended so high that we are no longer able to grasp the tumour we should spread the fingers at equal distances round it, and thus apply the pressure over a large space; the direction of this pressure will vary with the axis of the pelvis; when the fundus passes the os uteri it usually recedes suddenly. If we find the uterus contracted above the pubes, the hand may be withdrawn; but if it is flaccid and soft the hand should be introduced into the uterus so as to excite active contractions, and prevent a return of the fundus. The patient should then be kept quiet, and not allowed to make any sudden

exertion. When the uterus is partially inverted, and cannot be replaced, it is preferable that we should make the inversion complete, as recommended by Dr. Dewees. In some cases of these chronic inversions the uterus has been removed by ligature.

Of Twins.

What is the average proportion of twins in this country? About one in seventy-five.

How are twins situated in regard to each other? They may be enclosed in one common covering of membranes and float in the same waters. In other instances they may each have a separate amnion, while the chorion may be common to both; or each may have its own membranes, waters, and placenta.—*Dewees.*

How may a case of twins be known after the birth of the first child? The abdominal tumour does not subside as it does in a case of a single child. The child may be felt through the abdominal and uterine parieties; there is generally a renewal of the pains, and the child can be felt per vaginam.

After the birth of the first child, and it is ascertained that there is a second, what is to be done? Pain will either come on and deliver the child. (in which case we should conduct the case as though it was an original labor,) or there will be a suspension of pain.

How are we to proceed when there is a suspension of pain? In this case the uterus will be either contracted or uncontracted. If in the first condition there may be hemorrhage; we should treat it as any other case of hemorrhage, and deliver if necessary; or hemorrhage may be absent, in which case friction should be made until it contracts.

If contracted, and pains do not pretty soon follow, say in half an hour, it will be better to proceed to delivery; but in no case where hemorrhage is absent without this tonic contraction being secured.

Of the Presentation of the Arm and Shoulder.

What are the presentations of the arm and shoulder? They may present in four different ways at the superior strait.

The position of the shoulder will be difficult to distin-

guish unless the arm is also down; in which case it will serve to indicate the position of the shoulder.

In the first position the head and side of the neck of the child is to the left side of the pelvis; and the right arm down, with the back of the hand anterior, and the palm posterior.

In the second the head and side of the neck will be to the left side of the pelvis, the palm of the hand will look outwards and the back to the posterior part of the pelvis.

In the third the head and side of the neck will be to the right side of the pelvis; the left arm down with its back looking outwards, and the palm inwards.

In the fourth the right arm will be down, with the palm looking outwards, and the back inwards.

When turning is resorted to which hand should be used in these presentations? In the first and fourth the right hand must be used, and in the second and third the left.

What use should be made of the arm in shoulder presentations? It offers no indications except that it points out the situation of the shoulder. There can be no manœuvre performed upon it to advantage, so that traction, amputation, &c., should be entirely avoided.

What are the indications in these presentations? They are to bring down the feet, and deliver.

There are however three modes pursued in these cases: One is to turn; the second is to trust to the powers of nature to produce the "spontaneous evolution" of the child; and the other is to use cutting instruments to the child.

The first should always be practiced when it is possible to do it, and the earlier (when the os uteri is in a condition to permit it), the better.

When the waters have been long drained off and the os uteri and other parts of the uterus are firmly contracted so as to oppose the introduction of the hand, and the parts are pushed down low in the pelvis, turning cannot be permitted.

This condition should be counteracted by the free use of the lancet and opium; as soon as relaxation is induced we may turn, unless the shoulder is too firmly wedged to permit it to be raised. When the child is dead and in this condition we may deliver by the use of instruments.

Prolapsus of the Umbilical Cord.

What danger is to be apprehended from prolapsus of the

cord? It may be compressed, and the life of the child destroyed by the interruption to circulation.

How may it be distinguished? Before the rupture of the membranes we may possibly feel a pulsating, projecting mass like a finger; when the membranes are ruptured the cord comes down, and may form a large coil.

What is the treatment? When left to itself the child is generally destroyed, unless there is a very quick labor.

The remedies are generally turning, and delivery by the forceps. It is also advised to make attempts at replacement, but it does not always succeed. When the labor advances very rapidly sometimes the cord may be protected by placing it in that relation to the head and pelvis where it will be least pressed upon.

Of Rupture of the Uterus.

What are the causes of rupture of the uterus? Blows, violent pressure, ill conducted attempts to turn the child, mal-adroit use of instruments, the unequal surface of the child, a contracted pelvis, an unusual sharpness of the linea ilio-pectinea, exostoses, tumours, scirrhi, and ulcers.

It what portion does it usually happen? It most commonly happens at or near its junction with the vagina, but may occur at any part. It may be more or less extensive, and may be complete, or partial. In the first case the uterus and peritoneum are both ruptured; in the second the uterus alone is involved.

What are the symptoms? There is sudden acute pain at the point of the rupture, a discharge of blood, a cessation of uterine contractions, great consternation, the presenting part recedes, the face becomes pale and cold, the respiration hurried, and vomiting takes place; loss of sight, faintness, convulsions, and death follow.

What is the treatment? Delivery should be effected as speedily, and gently as possible.

Gastrotomy may be performed when the whole child has passed into the cavity of the abdomen, and it is impossible to seize the feet.

Of Deliveries Performed by Cutting Instruments applied either to the Mother or Child.

What are the causes which may render one or the other

of these expedients necessary? Deformity of the pelvis, and deformity of the child.

What may be considered as the resources of our art in cases of deformity of the pelvis? Turning, forceps, cephalotomy, Cæsarian operation, premature delivery, section of the pubes, and regimen during pregnancy.

Under what circumstances may turning be adopted? The rules already laid down should be attended to, and it should not be resorted to when the antero-posterior diameter at the superior strait is less than 3½ inches; and then it may be considered as a remedy for the safety of the mother rather than the child.

What is the smallest diameter of the pelvis at the superior strait in which the forceps may be safely used? Three inches; then the head of the child should be of moderate size, yielding, and the forceps skilfully used. They are preferable to turning in most cases of deformity.

Under what circumstances may cephalotomy be resorted to? We may resort to the perforator and crotchet in cases where the antero-posterior diameter is 2½ inches or more, and is so small that the head cannot be delivered by the forceps.

If the child is living we should choose between this, and the Cæsarian operation; the latter of which in many respects should be preferred.

What are the smallest diameters admitting of delivery *per vias naturales* by the crotchet? Two inches in the antero-posterior, and three or three and a half in the transverse.

What is understood by premature delivery? It consists in inducing labor artificially at a period of pregnancy when the child is sufficiently developed to exist after birth, and yet so small, and the bones of the head so soft as to pass through the contracted pelvis of the mother.

What is the proper period for its performance? The most eligible time is between the thirty fourth and thirty sixth week of utero-gestation; or if the deformity be very considerable we may commence operations as early as the thirty second week. The operation should be delayed in all cases as long as it can be done safely, as by so doing the labor will more nearly resemble a natural one, and the chances of the child are increased.

What is the mode by which it is accomplished? Accor-

ding to the directions of Dr. Rigby we should first give a full dose of calomel and colocynth, so as to effectually clear out the bowels; then a warm bath; ergot should then be administered in scruple doses of the powder, and repeated every half hour for five or six times. These means will generally bring on labor; if they fail a catheter should be passed, and the membranes separated from the uterus for some distance; if this fail then the membranes should be ruptured. Others advise the rupture of the membranes, or their separation from the uterus to precede all other means.

What are the benefits likely to result from a section of the pubes? It is an operation that is now almost universally condemned, and therefore not practiced.

PART VI.

THEORY AND PRACTICE OF MEDICINE.

Of Disease.

How may diseases be divided? Into organic and functional.

What is the character of the first class? There is a change which is appreciable by our senses, in the structure of one or more organs.

What is the character of the second class? The disordered function is not attended by any appreciable lesion.

Each of them may again be divided into acute and chronic, and general and local affections.

Which of the two classes are generally the most fatal? Organic diseases; but several of the functional are extremely mortal, as tetanus and hydrophobia.

What is meant by *local organic diseases?* Those in which the important symptoms are local, and are nearly in proportion to the anatomical lesions found after death, when it takes place. They may be acute or chronic.

What are the *general organic diseases*? They are often chronic, as the tuberculous and cancerous diseases. The acute are certain epidemic dysenteries, fevers, scurvy, and gangrene. Tubercles are, however, sometimes acute.

Which are the most manageable, the general or the local diseases? The local. The general can be rarely cut short by remedies; the treatment for these is more useful in obviating the secondary inflammations that so often accompany them and prove the immediate cause of death, than in abso-

lutely terminating the affection itself. Treatment is, however, important as it enables us frequently to conduct disease to a favorable termination which might otherwise prove fatal.

May *functional diseases* be either acute or chronic? Yes; and they constitute a large class of affections. Sometimes they are a symptom of an organic disease.

Do acute functional disorders ever simulate inflammations? They do; and it requires care and experience to discriminate them.

What are instances where they may be confounded? Pleurodynia with pleurisy; and local pains occurring in hysteria with the acute phlegmasiæ of the viscera.

How are they distinguished? Acute functional disorders commonly assume the form of neuralgiæ, in which the character of the pain contrasted with the slight vascular disturbance is sufficient to point out its true origin.

Are these acute affections always limited to pain? They are not; they assume at times every variety which the change in the function of an organ can produce, and are often difficult of diagnosis and treatment.

How is a diagnosis to be made in these doubtful cases? By exclusion; and by this means we can frequently affirm that the absence of unequivocal signs of organic lesion, is conclusive proof that the disturbed function depends upon a cause which is connected with the nervous organization of a part, and not with a material change of the structure.

Are the chronic functional disorders sometimes mere symptoms of a distant local affection? They are; and at other times independent.

What are some of the chronic functional disorders? Most cases of mania, hysterical affections, many cases of dyspepsia, &c.

Are the functional disorders numerous? They are as numerous as the organic lesions, and much more difficult to manage.

Is classification arbitrary? It is; and the nomenclature also in many instances.

What enhances this difficulty? The circumstance that many lesions which are separated as distinct diseases from others of a similar nature are in reality the effects, and not the cause of diseased action. Thus the term hydrothorax is now seldom used; the symptoms to which it was applied

are still observed; but it is now known that they depend upon a disease of the heart, and the effusion of serum into the cavity of the chest is only a consequence. It is necessary however, for convenience, to name, classify, and arrange the different forms of disease according to the facts we now possess.

Semeiology and Diagnosis.

What is meant by semeiology? The symptoms of disease studied with reference to the internal changes with which they correspond.

What is diagnosis? It is the art of distinguishing one disease from all others, and is based upon the comparison of the symptoms we observe in a particular individual with those known to exist in other cases, in connection with the order of time which they appear. A more refined kind of diagnosis consists in determining the particular variety and stage of the disease, which includes prognosis or the art of determining the result.

What are the signs of disease? They are the physical or those derived from a knowledge of the physical condition of the organs, obtained by physical examination; and the functional, to which the term symptom is usually confined.

What class of diseases admit of both these means of diagnosis? The organic; the functional can only be distinguished by the latter.

To what part are the physical signs particularly applicable? To diseases of the thoracic cavity, but they are by no means entirely confined to it.

From what are the physical signs derived? From an inspection of the exterior, from palpation or touch, and from auscultation and percussion.

What does *inspection* of the exterior of the body indicate? Distention when a change of structure in the organs is sufficient to dilate the parieties. As in dropsy, tympanitis, extreme enlargements of the liver and other abdominal organs, emphysema, pericarditis and pleurisy with large effusion. Pleurisy after adhesion has occurred, and phthisis, cause contraction.

What are the benefits of *palpation?* It assists ocular inspection. We can better estimate slight elevations, and also the degree of sensibility of the surface and internal viscera. If the degree of sensibility of the viscera is wished

for we press gently and equally with the whole hand; if of the surface we pass the tips of the fingers lightly over the skin?

How is *percussion* performed? By placing a pleximeter (and the forefinger of the left hand makes a very good one) on the surface, and tapping quickly but lightly upon it with the extremities and not with the pulps of one or more fingers of the right hand.

What kind of knowledge is derived by percussion? It enables us to distinguish the density of the part or organs beneath; as between a gas which gives a clear resonant sound and a liquid or solid mass which yields a flat sound. We are therefore obliged to recollect what sound the part yields by percussion in a normal state, to determine the deviations in disease.

What is meant by *auscultation?* It is the art of distinguishing by the ear sounds produced in the particular parts of the body in health and disease.

How is it performed? By applying the ear directly to the part, when it is immediate; or by using a tube called a stethoscope to collect and conduct the sound, when it is called mediate.

This method of exploration is principally confined to diseases of the thorax.

What are the points to be observed in auscultting the chest? The natural sound of respiration is heard principally during the act of inspiration over the greater part of the chest, and is a soft regular murmur, with very little blowing sound. Between the scapulæ, and at the summit of the right lung the inspiration is of a more blowing character, and the expiration is also heard at these points, from the nearness to the large bronchial tubes, and their preponderance over the vesicular structure. These blowing sounds are, however, slightly mingled with the natural respiratory murmur.

How are these blowing or bronchial sounds, and the vesicular murmur affected by disease? By enlargement of the tubes, cavities communicating with them, and hardening of the tissue of the lung.

What names are given to the rude and blowing sounds of respiration which correspond to different states of the lung? Rude or rough respiration; bronchial respiration; cavernous respiration; and the amphoric respiration.

What are the characteristics of the rude or rough respiration, and upon what condition of the lung does it depend? The vesicular murmur is usually more feeble than natural, but the blowing sound more distinct in both inspiration and expiration. Sometimes the vesicular murmur is exaggerated although the blowing sound is greatly increased. In the first kind there is equal hardening around the tubes; in the second the hardened masses are scattered through the tissue of the lung which is permeable.

What are the conditions upon which the bronchial respiration depends, and what are the symptoms? It occurs when the tubes are dilated, and in complete hardening of the tissue around the larger bronchi. No murmur of vesicular expansion is heard, the air sounds as if blown through a tube in inspiration, and seems to reverberate back again during expiration. When very strong it is called tubal respiration, which occurs in the second stages of pneumonia, phthisis, &c.

What are characteristics of the cavernous respiration, and upon what does it depend? It is similar to the bronchial, but more concentrated, and depends upon the existence of a defined cavity. It occurs in phthisis, and in gangrene of the lungs

What are the characteristics of the amphoric respiration, and upon what does it depend? It is a modification of the cavernous, but more diffused and metalic in its character; it is caused by the hardened walls of a very large cavity, or from the pleura in pneumo-thorax.

Are these modifications of respiration attended with corresponding changes in the resonance of the voice? They are; and it is heard more strongly in proportion as the respiration becomes more decidedly bronchial, or cavernous.

What is the corresponding modification of voice in the cavernous respiration? Pectriloquy. When bronchial, bronchophony.

How is the state of the bronchial mucous membrane known? By the rhonchi; the sonorous and sibilant ronchi (giving rise respectively to a cooing and whistling sound), indicate thickening of the larger or smaller tubes, and are called the dry rhonchi.

What are the moist rhonchi? The mucous, the sub-crepitating, and the crepitating. In the first the sound resembles that produced by irregular, but large bubbles of liquid;

when intense it is called gurgling. The other moist rhonchi are caused by smaller bubbles in the vesicles and finer tubes.

In what diseases is the respiration feeble? Catarrh, emphysema, and the first stage of tubercular disease.

What is the character of the sounds of the heart in a natural state? Regular; the first sound is more dull and prolonged, and occurs during the systole; the second is more sharp and short, and it is heard during the diastole. When the valves are diseased, or the blood is driven with extreme rapidity through the heart these sounds become rough. According to the degree of roughness they are then called bellows or rasping sounds. The thickness of the walls of the heart is estimated by the force of the impulsion against the thoracic parieties.

What is meant by the functional signs of disease? They are partly those alterations in the functions that we observe ourselves; and partly the sensations experienced by the patient, and by him communicated to the physician. By them we are assisted in determining the condition of the internal organs.

In what order should these symptoms be examined? First, by observing the decubitus or position of the patient; and whether it be equally easy in all situations. The color and appearance of the skin and the expression of countenance often afford valuable evidence. The cerebral functions should be examined. The intelligence, memory, state of the senses, cutaneous sensibility, functions of motility, and the strength, furnish signs of disorder of this function, whether from functional or organic defect.

The deglutition may furnish valuable signs. The various functional derangements of the thorax should be closely examined if they exist.

The symptoms connected with the organs of digestion are very numerous, important and require an examination of the greater part of the alimentary tube. Under this head the state of the tongue and adjacent membranes should be examined.

The secretions of the kidneys should be attended to, and chemical tests used if necessary.

Chemical tests may also be used in examining other secretions.

Fever.

What are considered to be the essential symptoms of fever? A quick pulse, preternatural heat of the surface of the body, with a sense of chillness at the commencement; are the most common symptoms of that condition we term fever.

How is fever divided by pathologists? Into idiopathic and symptomatic; or primary and secondary.

What is understood by idiopathic fever? It is where the fever does not depend upon a local fixed imflammation or irritation, but is produced and sustained by causes producing a general morbid state of the system.

What is understood by symptomatic fever? It is where the fever is produced and kept up by a primary local inflammation or irritation.

What are the causes of fevers? They are divided into the predisposing, and exciting.

The former are those external, and internal causes which tend to lessen the powers of the system to resist morbific agents, from the existenc of some functional, or organic defect.

The later are those which excite fever by deleterious impressions made on the system, and are checked perspiration, worms, atmospheric temperature, miasmata, noxious gases, heat, cold, electricity, humidity, mechanical injuries, and the various contagions.

What is understood by miasmata? It is a morbific agent which acts through the medium of the atmosphere, and eludes our most delicate chemical tests; but known from its effects on the human system.

What are the conditions necessary for its production? The presence of vegetable, or animal matter in a partial state of decomposition; moisture and a certain degree of heat, say 80° or thereabouts.

How is miasmata divided? Into *koino- miasmata*, and *idio-miasmata*.

What is koino-miasmata? It is the product of the decomposition of marshes, and public filth of cities, called com only *marsh-miasmata*, or *malaria*.

What is idio-miasmata? It is the product of the decomposition of the exhalations and secretions of the human

body accumulated, and confined in ill-ventilated habitations.

What is understood by contagion? It is a deleterious agent; the product of secretion of the animal body in a state of disease, which when applied to a healthy individual, either by direct contact, or through the medium of the atmosphere, produces a disease specifically similar to the one from which it derives its origin.

What constitutes a course of fever? It is the series of phenomena which intervene between its commencement and termination in convalescence.

How is the course of fever divided? Into intermitting, remitting, and continued; according as its phenomena intermit, remit, or are continuous.

What are stages of a course of fever? They are the forming, cold, hot, critical, declining, and convalescing.

What are the symptoms of the forming stage? Loss of appetite, disturbed sleep, yawning, stretching, wandering pains, an unpleasant sensation at the stomach, a general feeling of *malaise*, nausea, &c.

What are the symptoms of the cold stage? A sensation of chilliness, a pale contracted and dry state of the surface, the volume of the body is diminished, the respiration is confined, irregular, anxious, and oppressed, frequently with a short dry cough, dry tongue, thirst, pulse small, frequent and feeble, with nausea and vomiting.

What are the symptoms of the hot stage? Augmented heat, fullness, and redish color of the surface, flushed countenance, pulse full, quick, frequent and vigorous: or small, tense, quick, and frequent; throbbing in the head, eyes prominent, and sensible to the light; skin dry and hot; urine scanty high colored, &c.

What is meant by crisis? It is that period at which the disease has arrived at the highest point, and either a favorable or fatal issue takes place; it is generally attended with some evacuation, as sweating, or increased flow of urine.

What is meant by the revolution of a fever? It is the space of time occupied by one paroxysm of fever and its succeeding intermission; or the time which intervenes between the regular periodical exacerbations of fevers not paroxysmal.

What is the form which a fever assumes in respect to its revolution, called? Its type.

Intermittent Fevers.

What are the types of intermittent fever? They are the quotidian, when the period of revolution is 24 hours; tertian when it is 48 hours; quartan when it is 72 hours; and quintan when it is 96 hours.

What are the periods of a paroxysm of intermittent fever? There are three; the cold, hot, and sweating.

What are the varieties of intermittent fever? They are the inflammatory, the congestive, the gastric, and the malignant.

What time of year does the inflammatory variety occur? Most frequently during the winter and spring.

What is the most frequent type? The quotidian.

What are the symptoms? In the hot stage the heat of surface is intense, and the pulse is peculiarly strong, hard, and full. The most characteristic mark of this variety is the want of a complete apyrexia between the paroxysms; the febrile symptoms continuing.

In what class of persons do congestive intermittents occur? In persons of exhausted or debilitated habits.

What are the symptoms? The cold stage is protracted, there is deep seated pain in the head, vertigo, fainting, sense of weight or oppression in the breast, coma, a small weak pulse, hot stage comes on slowly and imperfectly, the breathing is confined and anxious, with an internal sensation of heat.

What are the symptoms of gastric intermittents? There are prominent symptoms of gastric and intestinal irritation, redundancy of biliary secretion, and other saburral matters lodged in the intestinal canal. They generally occur in autumn, and are attended with a foul and bitter tongue, much nausea, and bilious vomiting, an icteric hue of the skin, a sensation of weight in the right hypochondrium, and frequently with visceral disorders.

What are the symptoms of malignant intermittents? A copious and fœtid perspiration, colliquative hemorrhages, petechiæ, and othersympt oms of malignancy.

What is understood by masked agues? It is where other affections, such as neuralgia, sciatica, hemicrania, dysentery, cholera, &c., occur in a strictly periodical manner; like intermittents.

What is the most frequent cause of intermittents? Koinomiasmata.

What is the treatment? It is divided into that proper during the paroxysm, and that which is to be employed during the intermission. Treatment is seldom necessary during the paroxysm in the intermittents of our climate.—If the cold stage is protracted, or there is much congestion, it may become necessary to administer stimulants, and apply revulsives to the extremities. Bland warm drinks may also be given to allay thirst. During the hot stage it may be necessary to moderate excitement, and hasten the sweating stage by bleeding, diaphoretics, &c. We may anticipate the treatment proper during the intermission in this stage, by combining our diaphoretics with mercurials. Where the determination to the brain is alleviated if it exist, Dover's powders, and calomel answer remarkably well tending to produce sleep, and promote the sweating stage. In the intermission, mercurial cathartics will be proper, unless mercury has been combined with the diaphoretics during the hot and sweating stage; in which case jalap, castor oil, &c., will answer. Emetics may also be administered if indicated. Whenever the stomach and bowels, and secretions of the liver indicate a more healthy action, and the intermission is pretty well established by the reduction of inflammatory action, we should administer cinchona or its active preparations, with or without opium, which in many cases is a useful adjuvant, with a view of breaking up the paroxysms.

In the congestive form it may be necessary to administer quinine, and other febrifuge tonics before we can have time to prepare the system by cathartics, &c. Other remedies may also be used, among which arsenic stands prominent; and it is thought by some that when the paroxysms are broken up by arsenic that they are less liable to recur.

When visceral obstructions, and other sequelæ occur, they should receive their appropriate treatment.

Remittent Fever.

Is there any essential or radical difference between remittent and intermittent fever? There is not; but from their running a different course, a modification of treatment becomes necessary.

What are the symptoms? Languor, drowsiness, pains in the head and back, slight chills, anorexia, tongue covered with a brownish fur, nausea, skin dry and hot, thirst, and the pulse is irritated. The febrile excitement abates but not so as to amount to a state of apyrexia; this remission lasts a short time; the febrile excitement again rises until it acquires its former violence or exceeds it; which after a certain period again abates, and forms the remission. The grade of violence of these exacerbations vary much in different cases, and different latitudes.

What are the indications to be fulfilled in the treatment? They are to moderate febrile reaction; to remove from the alimentary canal vitiated and irritating secretions; to remove gastro-intestinal irritation, and restore the healthy functions of the liver and alimentary canal.

How may these indications be fulfilled? The first by blood-letting in many instances, cathartics, diaphoretics, cold applications, and revulsives.

Cathartics to the extent indicated may fulfil the second.

And the mercurial preparations, cupping, blisters, &c., are of essential service in the third indication. When the system is properly prepared, quinine given during the remissions will often break up the paroxysms, and it may frequently be combined with diaphoretics, particularly with the sweet spirits of nitre, and given when the febrile symptoms would preclude its use alone.

Yellow Fever.

How is yellow fever divided? Into inflammatory, adynamic, and congestive or malignant.

What are the symptoms? As premonitory, generally there is depressed mental energy, low spirits, slight chills, nausea, pain in the loins and back, giddiness, &c. In the regular attack there is occasionally shivering, but generally the premonitory symptoms are succeeded by great excitement, severe pains, and cramp. The eye is swelled, dejected, moistened with tears, and has a dull, heavy, drunken appearance.

The skin is flushed, dry, and hot; the pulse is accelerated, and generally full, soft, and compressible; the bowels are variable; the respiration is hurried, usually nervous, and attended with sighing.

This state of excitement is followed sooner or later by collapse and yellow hue of the skin and conjunctiva; and black vomit.

The symptoms vary very much in different cases, however.

What are the indications in the treatment? To subdue the inflammatory and irritated condition of the system, both local and general; to prevent the state of collapse; and when the inflammatory state of the system is subdued to sustain the powers of the system.

Continued Fever.

What is continued fever? It is a fever without intermission, and when remission exists it is scarcely perceptible, and of very short duration.

How is continued fever divided? Into synocha, synochus, and typhus.

What is understood by synocha? It embraces all those fevers which are violently inflammatory.

What are its symptoms? There is hardness, quickness, and tension of the pulse.

What is understood by synochus? It is a grade of fever between synocha and typhus; and occurs more frequently than any other in the intermittents and remittents of our climate. It indicates a grade of excitement, and not a distinct disease.

What is understood by typhus? There is a lower grade of fever and a proneness to sink.

What are its symptoms? A small, weak, quick, and frequent pulse; with great disturbance of the sensorial powers,

Typhoid Fever.

What other name is sometimes given to typhoid fever? Dothinenteritis.

What are the symptoms? In the first stage there is prostration more than proportionate to the local symptoms, dullness of intellect, cephalalgia, wandering pains in the back and limbs, dizziness, sometimes epistaxis, diarrhœa in about half the cases, anorexia, chilliness, and irregular fever.

In the second stage there is an increase of the cerebral symptoms, dullness of hearing, tinnitus, often delirium; increase of fever, dryness of the skin, diarrhœa, pains in the abdomen with tenderness, especially at epigastrium and

right and left iliac regions, tympanitis, enlargement of spleen, anorexia, eruption of rose colored papulæ on the abdomen and thorax, sudamina, cough, and sibilant rhonchus.

When the prognosis is favorable the third stage is characterized by the symptoms of the second stage with a gradual diminution about the end of the second week and convalescence at the end of the third. If unfavorable, there is sordes on the teeth, stupor, coma, muttering delirium, great prostration, diarrhœa, increased at times, with discharges of blood, and rigors.

What is the pathological anatomy of this disease? There is a thickening and secretion of whitish matter into the glands of Peyer and their sub-mucous tissue. The mesenteric glands are enlarged, and the spleen softened slightly. In the *second* stage there is increased alteration of the glands of Peyer, as well as injection and commencement of ulceration in the adjoining mucous tissue; softening and thickening of the mesenteric glands and spleen. Sometimes there is an inflamed state of the bronchial mucous membrane, gastritis, and softening of the mucous membrane of the large intestine. There is also usually injection of the membranes of the brain or effusion of serum, but never sufficient to explain the violence of the cerebral symptoms. In the *third* stage the glands of Peyer are ulcerated: the ulcers have irregular excavated edges; sometimes the ulcers are preceded by distinct yellow sloughs in the second and third stages; the mucous membrane around them is reddened but not much altered in consistence. The mesenteric glands are softened, reddened, and often infiltrated with purulent matter. Pneumonia is often present.

Can typhoid fever be cut short abruptly by treatment? No; the main object of treatment is to prevent or remove local inflammations, which cause the greatest uneasiness to the patient, and are often the immediate cause of death.

What is the treatment? In mild cases but little should be done. A small bleeding, with diluents, acids, and neutral and effervescing draughts are generally all that is required.

When there are symptoms of cerebral determinations, cups, leeches, or cold applications will be useful; if diarrhœa, opiate enemata will be proper. If pneumonia attend cupping and leeching the chest will be proper. In the latter stages the sulphate of quinine and nutritious diet will

be proper if the powers of the system fail. If the secretions from the bowels are much altered mild cathartics will be proper, with which the bowels should be kept open if necessary.

What are the complications? There may be perforation of the intestine and its consequences. Undue determinations to the various organs. Tuberculous disease in the last stage. When epidemic it is very violent, and appears to be sometimes contagious.

These various complications, and circumstances require corresponding modifications of treatment.

Typhus Fever.

In what prominent particulars does typhus differ from typhoid fever? It is usually epidemic, manifestly contagious; the pains in the head, back, and limbs more severe; the *lesions* after death more variable; and no constant alterations as in typhoid fever.

What are the symptoms? In addition to the above symptoms there is occasionally epistaxis; nervous symptoms with profound stupor; dull suffusion of the eyes; petechial eruption (of a purplish tint in severe cases) towards the end of the first week, extending nearly over the whole body, neither so bright or prominent as in dothinenteritis. Sudamina are sometimes present although not so frequently as in typhoid fever; pulse frequent, and commonly soft; cough with mucus and sub-crepitant rhonchus in the lungs, with feeble respiration; percussion often dull at the same part from congestion; and a change is generally found in the appearance of the blood after death, with frequently a softened state of the solids.

What is the treatment? There is no specific treatment; the symptoms should be watched, and local congestions and determinations obviated by appropriate treatment, and by this means we can usually mitigate the severity of the attack. Sponging with chloride of soda in solution, and the use of cool acidulated drinks are beneficial. When the fever declines, tonics and wine are proper or when there is great prostration. Gentle purgatives are called for; and the saline diaphoretics are useful, especially the acetate of ammonia.

Inflammation of the Alimentary Canal and Accessary Organs.

Glossitis.

What is glossitis? Inflammation of the tongue.

What are the symptoms? A burning and throbbing pain in the tongue with a synochal grade of fever. The tongue becomes hot, dry, red, swollen, and with a sense of impending suffocation. It terminates sometimes in suppuration, and occasionally in mortification of a portion of it.

What is the treatment? Bloodletting decisively practiced, leeches to the lower jaw and tongue, incisions into the substance of the tongue along its middle, and blisters to the back of the neck. Tracheotomy may also become necessary.

Of Tonsillitis or Quinsy.

What is tonsillitis, and what are the symptoms? It is an inflammation of the tonsils. It is known by slight chills succeeded by a high grade of fever, and more or less pain in the fauces on swallowing. In a short time the pain becomes fixed, deglutition nearly or quite impossible, and one or both tonsils much swollen. The face is tumid and red, the carotids beat violently, and the respiration is difficult.—It generally terminates either in resolution or suppuration. It is caused mostly by cold and damp air, or suddenly checked perspiration.

What is the treatment? Vigorous antiphlogistic treatment should be adopted by general and local bloodletting, scarification of the tonsils, purgatives, and antiphlogistic diaphoretics.

When suppuration takes place it should be opened.

Parotitis or Mumps.

What is parotitis, and its symptoms? It is an inflammation of the parotid gland known by slight febrile symptoms, a feeling of stiffness in the jaws, and swelling and pain in one or both parotids.

What is the treatment? Keep the bowels open, and use mild diaphoretics. The parts should be kept warm, and avoid taking cold. If the inflammatory symptoms are violent the antiphlogistic course should be adopted. Should

the testicles become affected a blister should be put on the parotids.

Of Acute Gastritis.

What is gastritis, and what are the symptoms? It is an inflammation of the mucous membrane of the stomach, attended mostly with vomiting and a burning lancinating pain in the stomach. There is a desire for cool drinks, and an aversion to warm which aggravate the complaint. The pulse is small, tense, and quick; the pain is constant except for a moment after taking a cold drink; the patient generally lies on his back, and moves as little as possible.

What are the causes? Cold water rapidly swallowed, irritating and corrosive substances, fatigueing exercise, over distention, improper food, metastasis of gout or rheumatism, injuries, and miasm of some kinds.

What is the treatment? Bleeding, general and local, blisters over the stomach, mild mucilaginous drinks, weak lemonade or orangeade, laxative enemata, and after the phlogistic state of the system has been moderated, opium is beneficial in allaying the pain and vomiting. In convalescence great care is required in avoiding improper food.

Chronic Gastritis.

What are the symptoms? They are very similar to the acute form, only less violent and long continued, with disordered action of all the functions of the stomach.

What is the treatment? It may be treated on the same general principles as the acute.

Acute Enteritis.

What is it, and what are the symptoms? It is an acute inflammation of the alimentary canal, affecting the peritoneal and muscular coats, or mucous membrane.

What are the symptoms when the peritoneal coat is inflamed? An aching or burning pain about the umbilicus, obstinate constipation, unless the inflammation extends to the mucous membrane, in which case dysenteric discharges take place; nausea and vomiting, dry tongue, urgent thirst, and hot skin. The patient lies on his back with the knees drawn up, and shoulders elevated, with a tumid abdomen from flatus. Its course is rapid, and prone to terminate in

gangrene, in which event the pain subsides suddenly, the pulse sinks, the countenance becomes pale, the extremities cold, slight delirium, and sometimes convulsions attend.—It generally terminates either in resolution or death, by the eighth day. It is distinguished from pleuritis and hepatitis by a contracted, corded, quick, tense, and frequent pulse; and by the regular and strong action of the thoracic respiratory muscles; neither of which exist in the other affections. It may be regarded as a dangerous disease

What are the causes? Indurated fæces, spasm, injuries, purgatives, hernia, cold, metastasis, &c.

What is the treatment? Prompt blood-letting, leeching, mild purgatives, opium in the advanced stages, blisters, and mild mucilaginous diluents.

What are the symptoms when the mucous coat is inflamed? When the small intestines are affected there is some pain in the umbilical region, more or less nausea and vomiting, and the pulse is corded; the tongue is white or of a light brown; the bowels are loose or easily moved.

What is it called when the colon and rectum are the seat of the inflammation? Dysentery.

Dysentery.

What are the symptoms? It is often ushered in by the ordinary symptoms of remittent fever, pain in the bowels, costiveness, or diarrhœa, followed by frequent mucous and bloody stools, tormina, and tenesmus, with a retention of the natural feces. Tenesmus is one of the most constant and characteristic symptoms of this disease. The violence of the symptoms is a pretty good criterion of the danger of the disease.

What are the causes? Atmospheric vicissitudes, and kœno-miasmata.

What is the prognosis when the discharges consist almost entirely of blood at the commencement? More favorable than when composed of mucous tinged with blood.

What is the treatment? The indications are to moderate the excessive reaction of the heart and arteries, to restore the healthy action of the liver and skin, and to subdue the local inflammation of the bowels.

Whenever the pulse is firm and quick, or tense and frequent, blood may be drawn. Purgatives judiciously managed are beneficial; castor oil, and calomel, are among the

best. Diaphoretics, as Dover's powder combined with calomel, and followed by a laxative, are beneficial. Opium, sugar of lead, blisters, and anodyne enemeta are all beneficial.

Chronic Enteritis.

What are the symptoms? There is pain, and a sense of soreness felt on coughing or sneezing, languor, and weakness; the pulse is small, weak, and sharp, or corded; the hands and feet cold, flushed cheeks, and a burning in the palms and soles; pain after eating, diarrhœa, digestion is imperfect, and there is tormina. The discharges are slimy and bloody, or watery and profuse, and there is emaciation.

What are the causes? It may be a consequence of the acute form, but it much more frequently results from crude indigestible food, and other irritants applied to the bowels, or from atmospheric vicissitudes.

What is the treatment? Regulation of the diet is important and indispensable. Farinaceous diet such as arrow root, oat meal, barley, tapioca, rice and sago should be used, animal food and solids are generally inadmissible. Mild laxatives are to be used carefully. Leeches applied to the abdomen are also useful. Emulsions of copaiva, spirits of turpentine, and mucilaginous drinks may be used.

Of Acute Peritonitis.

What are the symptoms? It is ushered in by chills, pains in the limbs, &c. There is pain in the abdomen, and in all cases external pressure on the surface of the abdomen is very painful. The patient lies on the back with his feet drawn up, and shoulders elevated.

What are the causes? Mechanical injuries, violent exertions, perforation of the stomach and its consequences, parturition, metastasis, &c.

What is the treatment? The most important measure is decisive blood letting, general and local; with the application of poultices, and revulsives.

Purgatives, of which a good one is castor oil, combined with spirits of turpentine, are beneficial. Large doses of opium alone or combined with calomel are also employed.

Of Acute Hepatitis.

What are the symptoms? Pain in the right hypochon-

drium, a sensation of tightness across the abdomen, difficult respiration, the body inclined forwards, the pain extending to the clavicle and shoulder of the right and left side.—Pressure over the liver, and an attempt to lie on the left side produces pain. There are general febrile symptoms, costiveness, and a scalding in passing urine.

What are the causes? Miasm, atmospheric vicissitudes, injuries, metastasis, &c.

What is the treatment? Blood-letting general and local, mercurial cathartics, antimonials, diaphoretics, cupping, blisters, and nitro-muriatic acid.

Chronic Hepatitis.

What are the symptoms? When it is not the consequence of an acute attack it begins with disorders of the digestive functions; there is pain and tenderness over the region of the liver, and a dry harsh constricted state of the skin.

What is the treatment? Sometimes leeches are proper, and mercury is considered indispensable. Nitro-muriatic acid, blisters or other revulsives, and low diet are beneficial.

Of Inflammations of the Nervous System.

Cephalitis.

What are its varieties? They are meningitis and cerebritis.

How is meningitis divided? Into phrenitis when there is inflammation of the pia mater; and arachnitis when the arachnoid membrane is affected.

Phrenitis or Phrensy.

What are the symptoms of phrenitis? A sense of fullness in the head, generally nausea or vomiting, pain and febrile reaction increase, the eyes become flushed and sparkliug, and delirium ensues. The pulse is firm and active with a disturbed respiration.

What are the causes? It is seldom idiopathic, but commonly occurs during the progress of fevers.

Its exciting causes may be violent passions, insolation, the influences of cold, drunkenness, metastasis, &c.

What is the prognosis? It is attended with great danger, and this is generally in proportion to the violence and obstinacy of the symptoms.

What is the treatment? A vigorous antiphlogistic course is promptly demanded by blood letting general and local, ice to the head, purgatives, antimony, nitre, digitalis, &c.

Arachnits.

What is this commonly called? Acute dropsy of the brain, or acute hydrocephalus.

At what period of life does it generally occur? During dentition.

What are the symptoms? Wakefulness, irritability of temper, repugnance to light, pain in the head, restlessness, an irritated, quick, tense and active pulse, torpid bowels, retching and vomiting, delirium, dry skin, dilated or contracted pupils, somnolency, coma, strabismus, and paralysis or convulsions.

What are the post mortem appearances? Injection or thickening of the membranes, and an effusion of serum.

What are the causes? Hereditary predisposition, blows, falls, insolation, metastasis, dentition, intestinal irritation, and whatever may produce a determination of blood to the brain.

What are the indications of treatment? To moderate arterial action, to remove the congested and inflammatory state of the brain, to remove the causes of irritation. To fulfil these, blood-letting general and local, purgatives containing calomel, ice to the head, and blisters, are among the most useful means. The diet should be simple and unirritating.

Cerebritis or Ramollissement of the Brain.

What are the symptoms? It has been divided into two periods, with symptoms peculiar to each. In the first there is fixed and violent pain in the head, which may continue a long time, vertigo, obtuseness and confusion of intellect, loss of memory, and indifference to surrounding objects.—The pulse is often full and hard.

In the second there may be gradual or sudden paralysis of one limb or half the body, and difficulty of speech; coma sometimes occurs, followed by convulsions, which leaves a contracted state of the flexor muscles of the limbs, or rigidity, which has been considered as peculiar.

What is the treatment? General and local blood-letting, active cathartics, blisters, and mercury.

Of Inflammation of the Respiratory Organs.

Pneumonia.

What is understood by pneumonia? It is an inflammation of the substance of the lung.

What are the characteristic symptoms? Pain in the chest with fever, accelerated and oppressed breathing, cough, with a viscid and rust colored expectoration. There is the crepitant rhonchus at first, followed by the bronchial respiration.

How are the stages of pneumonia divided? Into four.

What are their anatomical characters? In the first there is sanguineous congestion or engorgement of a red appearance, but still it will crepitate.

In the second there is red hepatization, the lung sinks in water, and the color is not uniform, but when torn it exhibits fine granular points of the size of a pin head.

In the third there is suppuration or yellow hepatization, this suppuration is diffused in the form of purulent infiltration, and rarely assumes the form of a distinct abscess.

In the fourth there is gangrene in which the parenchyma is softened down.

What are the physical signs of these stages? In the first there is crepitant rhonchus; as it progresses there is dulness on percussion, some degree of bronchial respiration, and vocal resonance.

In the second crepitation and vesicular respiration cease, and the only sounds are those produced by the air and voice in the larger tubes, which are very loud, and are bronchial respiration, and bronchophony. There is pretty complete flatness on percussion, and the lung does not expand.

In the third the physical sounds are the same, until the effused matter begins to liquify, and then there is mucous rhonchus.

In the fourth there is added to the signs a putrid fetor in the matter expectorated as well as in the breath, together with sub-crepitant and mucous rhonchus, passing into gurgling and pectriloquy.

What are these signs as the inflammation abates? The crepitation and resonance return.

What are the varieties and complications of pneumonia? *Typhoid pneumonia*, *pneumonia complicated with bronchitis*, and *pleuro-pneumonia*.

What is understood by typhoid pneumonia? It is when pneumonia is attended by low adynamic fever from any cause, and the inflammation is rather of a congestive than of an inflammatory character.

What is understood by pleuro-pneumonia? It is where pneumonia is complicated with pleurisy, and the symptoms are modified by effusion.

What is the prognosis of pneumonia? It is a serious disease; more dangerous, the further the disease advances, and the greater its extent and complications.

At what period does death usually occur? About the begining of the third stage.

What are the causes? All causes which tend to produce asphyxia, violent exertion, atmospheric vicissitudes, and exposure, diseases of the heart, bronchitis, wounds, tubercles, and foreign bodies.

What is the treatment? In the first stage bloodletting, general and local, repeated if necessary, tartar emetic, mercury and opium, after bleeding.

In the second stage, mercury and opium are appropriate remedies; with external irritation by blisters; and expectorants containing an alkali.

According to the grade of action we may give digitalis, squill, &c., or senega, camphor, and carbonate of ammonia, as indicated. Hydriodate of potassa with senega or sarsaparilla will hasten absorption in convalescence.

In the third stage antiphlogistics are not to be used, and if remedies are used at all they should be of a stimulating kind, such as carbonate of ammonia, ether, camphor, senega, wine, &c.

In the fourth stage unless the general symptoms contraindicate its use, wine, quinine, &c., must be administered.

What is the treatment of the typhoid pneumonia? General bloodletting is not admissible; but local may be. Dry cupping, blisters, sinapisms, calomel and opium, with stimulants.

In the other complications the treatment does not differ much from ordinary cases of pneumonia, and requires a corresponding treatment modified by the state of the general system.

What is the disease commonly termed *bilious pneumonia*? It is simply pneumonia complicated with a deranged condition of the liver.

What kind of pneumonia usually attacks children? Lobular pneumonia; the anatomical character of which is diffusion of inflammation through several scattered points at the same time, and usually affects the posterior part of the lung.

What are the symptoms? The respiration is rough, there is generally mucous and sub-crepitant rhonchus, the respiration only becomes bronchial at the latter stages of the disease; there is also dullness on percussion.

What is the treatment? The position of the child should be changed frequently, and kept in a uniform temperature. Local bleeding in the commencement, counter irritants, and ipecacuanha internally, are valuable; or if the child be strong and robust, tartar emetic may be given.

Remedies to be of use should be persevered in.

Pleurisy or Pleuritis.

What is understood by pleurisy? It is an inflammation of the pleura.

What are the characteristics of this disease? A sharp pain in the side, diminished resonance of the side, a friction sound, with ægophony, followed by enlargement, and absence of respiration and voice in auscultation. There is always effusion.

How may we classify the products of pleurisy, or the matter which is effused in acute and chronic pleurisy? Into two classes:—Those in which absorption predominates over effusion, and the liquid is removed; and those in which the effusion predominates, and the liquid can only be removed through a perforation of the pleura.

What are the signs of absorption? The side becomes contracted, and from being larger than the other side becomes smaller. In some cases after a time there may be a weak respiratory murmur, slight resonance on percussion and of the voice.

What is generally the character of the fluid when effusion predominates? It is purulent; and constitutes the empyema of authors.

What are the signs? The same as those characteristic of liquid effusion modified by the length of time that effusion continues. Rigors, hectic fever, &c. may exist; which when they do, are indicative of a purulent effusion.

What is the prognosis in pleurisy? It is dangerous when neglected; but when simple, and remedies are promptly employed before the effusion is copious it generally yields readily. But when it is complicated with tubercles or it becomes chronic it may be fatal.

What are the indications in the treatment of pleurisy? To subdue inflammation; to promote the removal of its product; and in chronic cases to improve the state of the general health.

What are the means used for these objects? In the first stage full general bleeding to the extent of removing all pain on full respiration, or the hardness of the pulse is subdued; local bloodletting followed by a poultice, or hot, dry napkins, a repetition of the bleeding if necessary, brisk purgatives containing mercury and antimony; tartarized antimony alone, and blisters are useful. Then mercury, digitalis, colchicum, alkalies, &c., will be useful to fulfil the second indication, and to still further assist in reducing inflammation. The patient must use light diet, and remain in bed while there are acute symptoms.

To fulfil the third indication when the pulse is weak, or the fever hectic, a nutritious and tonic plan must be pursued so far as they are not contra-indicated by other symptoms. Counter irritation should be used now as well as previously, and the preparations of iodine internally and externally are very useful. Diuretics are also often indicated.

Is the operation of *paracentesis thoracis* advisable? It may be in some cases; for instance where there is a sudden effusion threatening suffocation or where there is an old extensive effusion increasing constantly, and showing no disposition to be absorbed; but the propriety of the operation is questionable, except in a very small proportion of cases.

Where should the opening be made? When the abscess points, there is no choice, this must be the part; in other cases, the intercostal spaces between the third and seventh ribs. The fluid should be drawn off at successive times, the orifice closed in the intervals, and the admission of air prevented.

What connection has pleurisy with tubercles? It may be a cause or a mere sign of their presence, and should therefore be closely watched until conducted to a full convalescence.

Laryngitis.

What is laryngitis? An inflammation of the sub-mucous cellular membrane of the larynx.

How is it divided? Into acute and chronic.

Acute Laryngitis.

What are the varieties? Sthenic and asthenic.

What are the symptoms of the sthenic form? Difficulty of swallowing, with high fever, preceded by rigors, hoarseness, husky convulsive cough, tenderness, pain, and constriction in the larynx; and difficult, prolonged, sonorous inspiration. The fauces are generally red; by pressing the tongue downwards the epiglottis may be seen erect, thickened, and of a bright red color. As the disease progresses the countenance becomes anxious, the lips livid, the eyes staring and watery, the voice reduced to a whisper, and the pulse is reduced and unequal. The patient then becomes enfeebled, delirious, comatose, and dies.

What are the symptoms of the asthenic? It differs from the sthenic in the absence of inflammatory symptoms and fever; and sometimes of pain and difficulty of deglutition.

What are the causes of acute laryngitis? Exposure to cold and wet, tonsilitis, swallowing scalding or corrosive liquids, &c.

What are the anatomical characters? A red injected and thickened state of the lining membrane.

What is the prognosis. It is the most fatal of all inflammations.

What is the treatment? In the sthenic form a most prompt and energetic antiphlogistic course should be adopted, by bleeding, calomel, and antimony, before effusion takes place.

Salivation should be attempted and brought about as soon as possible. Bronchotomy must be resorted to, if our other remedies fail, and the state of breathing requires it.

In the asthenic form mercury must also be used, but depletion is not allowable, except locally; blisters and other revulsives may be used. These failing, and other symptoms requiring it, bronchotomy should be resorted to.

Chronic Laryngitis.

What are the symptoms? It is more frequent than the

acute, exists in various degrees, and is known by hoarseness, a husky dry cough, with soreness or pain in the larynx on pressure.

What are the anatomical characters? Redness and thickening of the mucous membrane, contraction of the ligaments, fibrous degeneration, wasting of the muscles, and ulceration.

What is the prognosis? Slight cases are often curable.

What are the indications of treatment? To subdue chronic inflammation, and remove its effects; to relieve urgent symptoms. and improve the general health.

The parts should be kept at rest, and protected from dust, cold air, &c., leeching, blisters, a mild mercurial course, hydriodate of potassa, and the application of nitrate of silver, sulphate of copper, &c., either in solution or powder to the larynx internally are recommended.

It is often connected with phthisis, either as a cause or complication.

Cynanche Trachealis, Tracheitis, or Croup.

What are the symptoms? At first there are catarrhal symptoms, hoarseness, &c.; then stridulous respiration, a peculiar rough barking and ringing cough, with high fever; these symptoms are followed by general failure of the vital powers, with an increase of the unfavorable symptoms, lividity, suffocation, &c. It varies in intensity in different cases.

What are the anatomical characters? Redness of the mucous membrane, continuous or in patches; the sub-mucous tissue is swelled, and in advanced stages when there is sthenic action there is an effusion of a grey white albuminous matter, forming a false membrane having the shape of the trachea.

What are the causes? Exposure to cold and damp; and to humid ill ventilated places. It occurs from one to six years of age.

What is the prognosis? It is a serious disease; and if not quickly arrested by treatment soon terminates fatally.

What is the treatment? The indications are to diminish inflammatory action, and its consequences; to procure the discharge of such matters as are produced in the trachea; to subdue spasmodic action; and in the latter stages to support the powers of life.

At the first invasion an emetic of tartar-emetic or ipecac, is the best remedy; and in slight cases it will cut short the disease, particularly if followed by a warm bath, calomel, James' powder, and castor oil.

If the fever runs high, free blood-letting, soon after the administration of an emetic, which will assist its action; cupping, calomel, tartar-emetic, blisters, &c., are indicated. In the last stages where collapse has supervened, stimulants and cordials must be used, and anti-spasmodics in the spasmodic form.

Acute Bronchitis.

How is it distinguished? By the terms sthenic and asthenic.

What are the symptoms of the sthenic form? Marked inflammatory action, pain, constriction across the sternum, severe cough, with glutinous expectoration, high fever, and hurried breathing. The rhonchi are at first sibilant and sonorous, afterwards mucous and sub-mucous, with weakened respiratory murmur, and a clear sound on percussion, showing the vesicular structure free from disease. If not arrested it may become complicated with inflammation or congestion of the lungs, asphyxia, and death.

What are the symptoms in the asthenic form? The chief difference is in the symptoms of depression, with gastric derangement, great oppression of breathing, and mucous rhonchus in the early stages. It is almost peculiar to old people, persons in delicate health and young children.

What are the causes? Cold and moisture, variable atmosphere, and eruptive fevers.

What are the anatomical characters? A red color and thickening of the mucous membrane, with a frothy or purulent fluid in the bronchiæ.

What is the prognosis? It must be determined by the extent and stage of the disease, and the general condition of the patient.

What is the treatment? When sthenic, bleeding general and local, according to the condition of the patient, a purgative of calomel, small doses of tartar-emetic, tincture of digitalis, wine of colchicum, &c., will contribute to reduce the inflammation, and hasten its termination by expectoration. Revulsives to the chest are also useful. When there is a free secretion blisters and stimulating expectorants are

proper; and if a state of collapse comes on we must stimulate actively with carbonate of ammonia, camphor, &c. In the asthenic form depletion cannot be carried to much extent. Leeches, dry cupping, and blisters should be used, with small doses of mercurials and antimonials or ipicac, with a decoction of senega, squills, &c. In young children emeties and mercurials are useful in bronchitis.

Chronic Bronchitis.

Are acute and chronic inflammations of the air passages separated by a well defined line? They are not; the chronic are distinguished however by the continued presence of opaque matters in the expectoration, such as are classed under the head of albuminous.

What are the symptoms of chronic bronchitis? Expectoration, varying in different cases; when purulent, there may be hectic and night sweats like pulmonary consumption, but the physical signs are wanting; the chest expands well, and sounds well on percussion, and there are the various rhonchi which are continually shifting and changing.

What are the causes? Repeated attacks of the acute, breathing impure air loaded with irritating particles, &c.

What are the anatomical characters? The mucous membrane is of a deep red color generally, sometimes however paler than natural, where there has been copious purulent expectoration; ulceration is not a common occurrence unless there has been an habitual inhalation of dust.

What is the treatment? Counter-irritants, expectorants, and anodynes, with a close attention to the general symptoms. In those predisposed to this disease sponging the body with cold water, and vinegar and salt, is useful. The body should also be well protected by a flannel or leather jacket.

Phthisis Pulmonalis, or Pulmonary Consumption.

What form of disease is included under these terms? All diseases of the lungs dependant on tuberculous matter, or depositions and indurations allied to it.

What are its general characteristics? Cough, at first with little expectoration, sometimes hæmoptysis, as the disease progresses the expectoration becomes opaque, purulent, and copious, fever, quick pulse, night sweats, dyspnœa, emaciation and debility. The principal physical signs are irregu

lar expansion of the chest, dullness on percussion, with more or less bronchial respiration, and bronchophony in the upper parts of the chest, followed by cavernous rhonchus and respiration, and pectriloquy, which indicate more or less consolidation of the lung, succeeded by cavities communicating with the bronchiæ.

What are the anatomical characters? They may be arranged under the following heads:—

1st. The miliary granulations or tubercles, which are a number of little hard bodies of a semi-transparent, reddish drab, or skin color, or sometimes of a grey or ash color, generally in clusters.

2nd. A consolidation diffused through the pulmonary tissue without particular shape, varying in consistence, sometimes hard, and somewhat semi-transparent, resembling the miliary granulations, but generally darker.

3d. Opaque yellowish white masses; some are nearly solid, and others have a cheesy consistence. Tuberculous matter is frequently found diffused through the pulmonary texture, which is the infiltrated tubercle of Laennec. All these conditions tend to pass into a softened fluid state, form vomicæ, and leave the next form of lesion.

4th. Cavities or excavations various in number, form, and size, containing more or less tuberculous matter, liquid pus alone or tinged with blood, mucous, a mixture of all these, or empty. They communicate with the air tubes, and often with each other; their sides are composed of consolidated lung, rough and sometimes sloughy, or of an irregular coat of lymph; in others thick, rigid, and of a fibro-cartilaginous character. These lesions affect the upper and posterior more than the anterior lobes, and are often attended with various complications, such as bronchitis, pneumonia, &c.

How is the course of consumption divided? Into three stages. The *first* is that of the formation of the indurations, granular or diffused; the *second* is that of the conversion of these into yellow tubercle, and the extension of the lesion; the *third* is that of their softening, evacuation, and the formation of vomicæ.

What are the symptoms of the first stage? Hacking cough, either dry, or with thin and transparent expectoration; sometimes pains in the chest, quickness of the pulse, with occasional flushes of fever, terminating in perspiration; more or less dullness on percussion, increased bronchophony, and bronchial sound on expiration.

What in the second? The symptoms of irritation continue, there is languor, loss of flesh, increased pain, generally chills, fever, and sweating, more abundant expectoration, thicker and sometimes tinged with blood. The mucous and submucous rhonchi are heard. There are signs of increased density of the lungs, the dullness on percussion is increased, the respiration becomes more bronchial, and the vocal resonance is increased.

What are the symptoms in the third stage? The consumptive symptoms of the last are increased, a copious and heterogeneous expectoration of pus, mucus, softened tubercle, blood, shreds of lymph, and sometimes portions of pulmonary tissue; confirmed hectic, occasionally diarrhœa, increasing marasmus, &c. Cavernous rhonchus or gurgling is heard, followed by cavernous respiration and pectriloquy when the cavity is empty; and when it is very large the sound is amphoric. The walls of the chest sink and form a hollow below one or both clavicles, and there is a defect or irregularity in the movements of the chest. The expectoration is often nummular or with a defined margin and flattened like money, from which it derives its name.

Is phthisis a constitutional or a local affection? It is both constitutional and local.

What are the varieties of phthisis? They are the acute and chronic.

What are the indications in the treatment of phthisis? To diminish the local irritations and congestions that lead to the formation of indurations or tubercles; to correct the condition of the system which degrades the nutritive process and disposes to the formation of these diseased products; to promote the removal of those already deposited; and to treat troublesome symptoms and accidental complications.

In the first stage, antiphlogistic and counter-irritant remedies avail most; but depletion should be limited to cases in which there is plethora, pulmonary inflammation, congestion, or hemorrhage. Emetics, iodine, sarsaparilla, columbo, digitalis, carbonate of iron, pure air, change of climate, and exercise, are all useful when properly adapted to the particular case, and will sometimes arrest the disease. The diet should be mild and nutritious.

In the second and third stages depletions are less needed, and a somewhat tonic plan, with or without counter-irritants

are indicated, with a more generous diet. Mild expectorants and anodynes are often useful and necessary, and of the latter, hyosciamus answers better than opium or its preparations. Localities protected on their northern and eastern limits, and facing the south, are to be preferred as residences.

What means may be made use of in the prevention of phthisis? Prevent or speedily remove those inflammations and congestions which tend to the development of tubercles, and of that state of strumous cachexia or imperfect nutrition from which they arise. Hereditary predisposition is a prominent cause, and may be in some measure prevented by care in forming matrimonial alliances; intermarriage should never take place with families where the predisposition exists.

Attention to residence, food, clothing, exercise, &c. is necessary for persons predisposed. The powers of life should be maintained in as perfect a manner as possible, both by hygienic and remedial means.

Nephritis.

What are the symptoms? Slight chills, fever, pain in the loins darting down to the ureters, testicle retracted, the urine in small quantity, tinged with blood, and frequent desire to pass it. Cold is a frequent cause, also blows, strains, &c.

What is the treatment? General bleeding, cupping, leeching, purgatives, mucilaginous diluents, sinapisms, hot applications, &c.

Cystitis.

What are the symptoms? Violent burning, lancinating, or throbbing pain in the region of the bladder, perineum, and sometimes the testicles, with a sense of constriction in the hypogastric region, pain from pressure above the pubes, and stranguary.

What is the treatment? The same general course as in nephritis.

Pericarditis.

What are the anatomical characters? Redness, effusion of coagulable lymph, and a serous fluid in the pericardium.

What are the symptoms? Chills, fever, pain in the region of the heart, irregularity of pulse, palpitation, dyspnœa, &c.

The impulse of the heart is at first augmented, the sounds are increased in intensity, and when endo-carditis exists, are accompanied by a bellows murmur. On the second or third day a rubbing or rustling sound may often be heard, occasionally changing to one similar to creaking of leather. The impulse of the heart, as well as both natural and morbid sounds, decrease with the progress of the effusion. There is an increase of fulness of the left side, and dullness on percussion is elicited over a larger space than natural, the limits of which, define the degree of effusion.

Chronic Pericarditis is generally only the sequela of the acute variety.

What is the treatment? Vigorous antiphlogistic remedies must be used, such as bleeding, local and general; calomel and opium, or calomel and Dover's powders, given so as to affect the gums, are important remedies. Diluent drinks, with nitrate of potash, tartrate of antimony, absolute repose, and emolient applications to the chest are useful.

Endocarditis.

What are the symptoms? Besides the general symptoms of inflammatory reaction, there is violent action of the heart, augmentation of the extent of dullness on percussion, with the beat of the heart quite superficial. The most constant and characteristic of the phenomena of this disease is the bellows murmur. The chronic form may produce induration of the valves, and narrowing of the orifices, indicated by the bellows murmur, or the rasping, sawing, or musical sound.

Rheumatism.

How is it divided? Into acute, and chronic.

What tissue and parts are affected? The fibrous tissue, joints, tendons, and sheaths of muscles.

What are the symptoms of the acute? Pain in the part first affected, then swelling and extension to other parts, with fever, sweating, and a pungent odor arises from the perspiration. The fever is highest at night, the pain is increased by warmth; there is a tendency to effusion, and lesions of the heart mostly occur, which are indicated by their own peculiar symptoms.

At what period does convalescence occur? Rarely in the second week; most generally during the fourth, and often not until the sixth week; the pain, fever, and perspiration

then lessen, the urine is more abundant and less charged with deposit, the appetite returns, thirst diminishes, and the pulse becomes natural.

What are the causes? Hereditary predisposition, cold, and it often occurs without any assignable cause.

What is the treatment? The principal indication is to moderate the fever, bloodletting should be practiced according to the extent of fever and the plethoric state of the individual. Purgatives of calomel and senna, in the early stage, followed by nitrate of potash and tartrate of antimony, cooling drinks, and opiates at night, are useful. As local means, leeches followed by poultices impregnated with laudanum or decoction of poppy, are useful. After fever has subsided blisters should be applied, and repeated when the joints are swollen.

In chronic rheumatism local bleeding, blistering, &c. are useful. Dover's powders, warm bath, hydriodate of potash, tartarized antimony, tincture of actea, colchicum, and flannel bandages have reputation.

Gout.

What are the symptoms? What is called acute gout generally comes on suddenly, by acute pain in the first joint of the great toe, sometimes it is preceded by chill, fever, and restlessness: these symptoms are repeated every night for five or ten paroxysms, and subside. The affected part is swollen, has a shining appearance, and on its subsidence the cuticle peels off. It may be considered a constitutional affection, and depends upon a gouty diathesis, either hereditary or acquired by rich luxurious living and sedentary habits.

What is *retrocedent gout?* It is where gout is repelled and attacks some internal organ; and many become a very serious complication.

What is the treatment? When the system is plethoric, diminish repletion by blood-letting. Purgatives are generally proper, and colchicum has a deservedly high reputation. The diet should be mild and simple.

Retrocedent gout may be relieved often by hot stimulating pediluvia or sinapisms, and the suffering organ must be relieved according as is indicated by its condition.

Variola or Small Pox.

What is the most simple division of small pox? Into distinct and confluent; in the former, the pustules are distinct, elevated, distended, and scattered over the surface of the body: in the latter they are numerous, depressed, and confluent, or coherent.

What is the time between the reception of the variolous virus and the appearance of its effects? This is called the period of incubation, and varies from nine to fourteen days.

What are the stages of this disease? The initiatory, the eruptive, the maturative, and the declining.

What are the symptoms of the initiatory stage. Rigors, followed by fever, pain in the limbs, back, and epigastrium, with vomiting, very similar to gastritis.

At what period does the eruptive stage appear? About the end of the third or beginning of the fourth day; some say sooner. It commences on the face and extends over the whole body in about twenty-four hours.

At what period does the maturative stage occur? It is completed about the twelfth day, and preceded by exacerbations of fever, swelling of the face and other parts, for three or four days.

What is the period of decline or dessication? It commences about the twelfth day, and in mild cases, by the sixteenth or seventeeth day, the fever subsides.

At what time is the secondary fever high, in confluent cases? At the period of complete maturation or suppuration, and during the first part of the declining stage.

Is small pox apt to be a fatal disease? It is when in the confluent form, but not otherwise.

What is the treatment? In the initiatory stage the patient should be kept cool, and the antiphlogistic course pursued. Bleeding is proper in some cases; mild catharties, saline draughts and James' powder may generally be used; but others require an opposite course.

In the secondary fever, the treatment should be governed by the condition of the patient, which varies much in different cases. In the mild forms little else is needed except attention to the bowels.

Varicella or Chicken Pox.

What are the symptoms? Fever, mostly slight, continu-

ing from one to three days, terminating in a vesicular eruption which soon becomes shrivelled and falls in scales about the ninth or tenth day.

What is the treatment? When treatment is necessary it should be the same as that for mild cases of small pox.

Rubeola.

What are the symptoms? The period of incubation is generally from five to seven days. The first symptoms are those of catarrhal fever, followed by an eruption on the third or fifth day, of small red spots on the face, then on the neck, body, and extremities. They run into each other and form semi-lunar or crescentic patches, and are at their height of developement during the second day. Diarrhœa is a very common attendant.

What is the treatment? In general all that is necessary is to keep the bowels open, and give tepid diluent drinks freely. When complicated the treatment must be modified according to the symptoms.

Scarlatina.

What are the essential phenomena of the disease? Fever, a peculiar eruption, and inflammation of the fauces, which sometimes terminates rapidly in sloughing and ulceration.

How is it divided? Into s. simplex, s. anginosa, and s. maligna.

What are the symptoms of s. simplex? They are fever, generally followed by a scarlet eruption within forty-eight hours, commencing on the face and extending to the neck, trunk, and extremities, with a slight soreness of the throat. Both usually begin to decline about the fifth day, the skin desquamating.

What are the symptoms of the anginose variety? They are more severe than in the former, the eruption does not appear until the third day of fever, and then in irregular patches. In some cases there is sloughing, but not always.

What are the symptoms of the malignant? It commences like the preceding, and soon becomes violent and dangerous. The period of eruption varies from the second to the fourth day. Grey sloughs which become dark are observable in the throat; the functions are all much disturbed, and death frequently occurs early in the disease from cerebral oppression.

The prognosis of scarlatina varies very much in different cases, and according to the variety.

What is the treatment? There can be no general directions given applicable in all cases. We must be guided by general principles.

Hemorrhages.

What is hemorrhage? The escape of blood from vessels in which it is contained in a healthy state of the system.

What are the indications in the treatment of hemorrhage? To lessen the momemtum of the circulation if necessary; to diminish the determination to the part from which it occurs; and to excite a contraction of the vessels of the part.

The first indication may be fulfilled by blood letting, nitre, digitalis, cold, &c; the second by counter irritants and the direct application of cold; and the last by astringents either local or general.

Phlegmasia Dolens.

What are the symptoms? Pain and stiffness in the groin of one side, rigors followed by fever, the limb becomes swollen, painful, tender, and of a knotted feel; the skin has a pale, white, smooth, and glabrous appearance. It is peculiar to the puerperal state, the breasts become flaccid, and their secretion is suspended.

What is the treatment? Decidedly antiphlogistic; blood letting, purgatives, antimonials, &c.; after which opium, so as to allay pain and irritation may be proper. As local applications, leeches, fomentations, solution of muriate of ammonia, and stimulating linaments may be useful according to circumstances.

Apoplexy.

What is apoplexy? It is a disease characterized by a sudden suspension of the animal functions, a slow and full pulse, laborious or stertorous breathing, with a continuance of the vital functions.

What are the premonitory symptoms? Determination of blood to the head, indicated by throbbing and turgidity of the vessels, vertigo, ringing in the ears, pain, &c.

What are the terminations of an attack of apoplexy? In death during the paroxysm.

In perfect restoration of all the suspended functions.

In paralysis of certain parts of the body, with restoration of the functions in other respects.

And in a general febrile condition.

How may it be distinguished from syncope and asphyxia? In these conditions the pulse and respiration are absent, or nearly imperceptible.

What is the prognosis? Unless appropriate and energetic treatment soon make a favorable impression on it, the case is hopeless.

The duration of the attack may vary from a few minutes to several days. It generally occurs between the fortieth and sixtieth years of age.

What are the causes? Besides the predisposing from peculiar conformation of the body, age, plethora, and organic affections of the heart or large vessels, it may be excited by over distention, improper food, straining, intoxication, mental excitement, the repulsion of cutaneous eruptions, impeded circulation, &c.

What are the anatomical appearances? Vascular turgescence of the brain, sanguineous extravasation, effusion of serum, and occasionally little or no traces of disease are discoverable.

What is the treatment? The grand indication is to remove the vascular engorgement of the brain; which is best accomplished by bloodletting general and local, the application of revulsives to other parts of the body, with cold to the head. Active purgatives, emetics when the stomach is overloaded, and blisters, are important means.

What is the prophylactic management when the premonitory symptoms exist? A simple diet, exercise in the open air, avoidance of stimulating drinks and mental excitement, gentle cathartics if indicated, reduction of plethora, and an active course of life.

Paralysis or Palsy.

What is paralysis? Impaired or abolished power of voluntary motion or sensation, or both, in some parts of the body without coma or loss of consciousness.

What are the different kinds of paralysis? Hemiplegia, when the whole of one side of the body is affected.

Paraplegia, palsy of both inferior extremeties from the hips downward.

And partial, when some one particular part is affected.

What is the most common form of it? Hemiplegia, and it depends upon a similar condition of the brain to apoplexy.

Upon what does paraplegia generally occur? Affections of the spinal marrow generally.

What are some of the causes of partial paralysis? Affections of the brain or spinal marrow, injury of a nerve, and the action of lead.

What is the treatment? The same as for apoplexy in most cases. The pulse must be our guide in the employment of the lancet; electricity is often useful, particularly in the partial variety; nux vomica, rhus toxicodendron, oil of turpentine, arnica flowers, and galvanism may also be tried, in chronic cases.

Epilepsy.

What is epilepsy? A disease of the nervous system, manifested by convulsions at uncertain periods, in paroxysms, with a temporary loss of consciousness and voluntary motion, terminating in sleep.

What part of the brain is usually found diseased in post mortem examinations? The cerebellum.

What is the treatment? The cause should be carefully ascertained, and the treatment modified accordingly.

What are the remedies which have been thought to possess controlling power in this disease? Valerian, misletoe, oil of turpentine, peony root, agaricus muscarius, artemesia vulgaris, belladonna, opium, stramonium, musk, castor, assafœtida, phosphorus, oxide of zinc, sulphate of zinc, nitrate of silver, ammoniated copper, indigo, &c.

Chorea or St. Vitus' Dance.

What are its characteristics? Incomplete subserviency of the muscles of voluntary motion to the will, rendering their actions irregular. tremulous, and ridiculous. It may be general, or confined to particular muscles.

What are the causes? Derangement of the bowels, mental excitement, and all causes of constitutional debility.

What is the treatment? It should depend upon the condition of system producing or accompanying it; to which the treatment should be adapted. Among the remedies recommended are purgatives, the vegetable and metalic tonics, belladonna, cimicifuga, counter-irritants, galvanism, &c.

Convulsive Affections of Infants.

What are the exciting causes? Any causes which produce turgescence of the brain; the most frequent of which are intestinal irritation, dentition, worms, repelled cutaneous eruptions, plethora, and local injuries.

What are the indications in the treatment? To obviate the influence of the exciting cause; to allay nervous or cerebral irritation; and to protect the brain from the determination to it.

Tetanus.

What is tetanus? It consists in violent tonic spasms of the voluntary muscles, with the power of sensation and thought unimpaired.

How is tetanus divided? According to the part which is affected; when confined to the muscles of the jaw it is called *trismus;* when the extensor muscles of the trunk and extremities are the seat *opisthotonos; emprosthotonos*, when the body is curved forwards, and *pleurothotonos* when in a lateral direction.

When it occurs in children it is called *trismus nascentium.* It has also been divided into idiopathic and symptomatic; the former is produced by direct irritation of the nervous system, and the latter by indirect; that following wounds is called traumatic, and belongs to the symptomatic variety.

What are the symptoms? Slight spasms about the larynx, a feeling of stiffness of the jaws, neck, and shoulders, with spasms. When it terminates fatally it is usually by apoplexy.

What is the treatment? In the idiopathic, particular attention should be be given to the condition of the system, and the treatment adapted to its condition accordingly. In the symptomatic, attention both to the general condition, and to the local cause of irritation, is necessary.

The remedies that have been used are blood-letting, purgatives, sedatives, particularly opium, tobacco, antimony, hydrocyanic acid, cold affusion, mercury, amputation, tonics, wine, bark, &c., all of which may be proper when rightly adapted.

Mental Derangement.

What are the causes? They are hereditary and exciting; the latter of which is divided into moral or those which ope-

rate through the medium of the mind, and physical, or those which act directly on the body.

How are diseases of the mind divided? Into mania, monomania, dementia and idiotism.

What are the characteristics of *Mania?* General mental derangement, characterized by a rapid succession of incoherent ideas, and violent excitement of the passions, expressed by great agitation, loud vociferation, singing, menaces, and fury.

What are the characteristics of *Monomania?* It is a state of partial insanity, where the patient is insane on one subject only, with a full and regular use of his intellectual faculties on all or most other subjects. It comprehends many varieties as nostalgia, fanaticism, hypochondriasis, melancholia, misanthropy, &c.

What are the characteristics of *Dementia?* There is an association of unrelated perceptions or ideas, from an inability of the mind to judge and reason.

What are the characteristics of *Idiotism?* It consists in a defective development or impairment of all the intellectual faculties, sometimes amounting to total absence of mind.

What is the general treatment of mental derangement? The patient should be removed from his friends and home, placed in some quiet and secluded situation, have kind and humane treatment, free exercise in the open air, such employment and amusements as are adapted to his condition and appropriate remedies, adapted to the general state of health and condition.

Delirium Tremens----Mania a Potu.

What are the characteristics? General inquietude, tremors, continued watchfulness, cool skin, perspiration, delirious loquacity, and sensorial illusions; occurring in habitual drunkards and opium eaters, generally following the intermission of their accustomed stimulant.

What is the treatment? Emetics, opium, anti-spasmodics, and the alcoholic treatment, all have their advocates. The alcoholic treatment has been found the most successful in the Philadelphia Hospital; but the treatment with opium is perhaps more generally practiced than any other, either alone, or in combination with camphor and assafœtida.

Pertussis or Hooping Cough.

What is pertussis? It is a contagious cough, which has

a regular rise, progress, and declension, and occurring but once in the same individual.

What are the symptoms? It commences as an ordinary catarrh with lassitude, sneezing, head-ache, and hoarseness, followed by a dry ringing cough, which at the end of two or three weeks becomes convulsive or spasmodic, and in paroxysms.

What is the prognosis? It rarely terminates fatally, except by the supervention of bronchitis, hydrocephalus, pneumonia, apoplexy, or marasmus. The younger the patient the more apt is the disease to terminate fatally. It often calls into action strumous and tuberculous affections.

What is the treatment? It is capable of being mitigated, but not cut short in its course. When attended with inflammatory symptoms, blood-letting general and local, may be serviceable, and when the lungs are oppressed by the bronchrial secretions, emetics are indicated. Assafœtida is an excellent remedy with or without nauseants. Belladonna, lobelia, and counter-irritants, are also valuable remedies.

Asphyxia or Suspended Animation.

What are the causes which produce asphyxia? Hanging, drowning, or strangulation, and the inhalation of some irrespirable gas; also lightning or electricity, and intense cold.

What are the symptoms of asphyxia from drowning? A tinged and livid appearance of the face, the eyes are open and staring, limbs stiff, tongue protruded, the epigastrium tense and tumid, and the manifestations of life are destroyed. According to Orfila more or less water enters the stomach, by which he distinguishes between cases of drowning, and cases where life was destroyed before being placed in the water.

What is the treatment? The person should be well dried, wrapt in blankets, and placed in a convenient place for artificial inflation of the lungs, by a common bellows. Galvanism and electro-magnetism if at hand, stimulant injections into the rectum, and frictions may be very useful, in assisting to establish respiration, and revive the energies of the system. Heat should be applied by warm flannel, bottles of hot water, bricks, &c., in a gradual manner. When the functions are partially resumed stimulus carefully adapted, may be useful, and the patient should be kept perfectly at rest in a dry warm bed. These means should be persevered in and not abandoned too hastily.

What are the symptoms of asphyxia from the inhalations of carbonic acid gas? When undiluted it will quickly destroy life, but mixed with atmospheric air it is less sudden, producing vertigo, faintings, insensibility, and asphyxia; in which case the face has a tumid and livid appearance; the blood vessels are turgid, and the tongue swollen. It acts both by excluding the atmosphere, and as a poison.

What is the treatment? When the asphyxia is incomplete, recovery will soon take place by placing the patient in the open air, dashing a little cold water upon him, dry frictions, and wine and water. When perfect, the cold dash, or pouring water on the head will often excite respiratory movements, frictions with dry flannels or stimulating substances, volatile applications to the nose, &c., are propor.— If these do not quickly excite respiration, artificial respiration should be resorted to.

What is the treatment of asphyxia from electricity? The same as that for asphyxia from carbonic acid, and other mephitic gasses, cold effusions are particularly valuable in such cases.

What is the treatment of asphyxia from cold? The principal means is the gradual communication of warmth to the body; but it has to be done with the greatest caution, or it will destroy the little remaining vitality, or produce gangrene. The first applications then should be cold water or snow, then dry blankets in a room without fire; gentle frictions, and artificial inflation of the lungs, unless respiration takes place. If symptoms of life occur, the warmth may be increased, and warm drinks administered, of balm or sage tea, but stronger stimulants should be avoided.

Diarrhœa.

What are the characteristic symptoms? Frequent, and usually copious liquid feculent stools, with griping.

What is the morbid condition upon which diarrhœa depends? An irritated condition of the mucous membrane of the bowels, either from the action of irritating substances upon it, or from an increase in its irritability, in which case the ordinary secretions and contents of the canal will produce excessive peristaltic action.

What are the indications of treatment? To remove every source of intestinal irritation; to allay the morbid irritability of the mucous membrane of the bowels; and to diminish the determination of the blood to the intestinal canal.

Cholera.

What are the characteristic symptoms? Frequent, violent vomiting and purging, with severe tormina, and cramps in the muscles.

What are the indications of treatment? To allay as quickly as possible the irritability of the stomach and bowels, to restore the action of the skin and liver, and to determine the circulation from the internal to the external parts. Energetic means should at once be resorted to for these purposes, and opium, calomel, and active revulsives will generally fulfil the indications.

Flatulent Colic.

What condition of the digestive organs predisposes to this disease? A weak, and irritable state of them. Ordinary articles sometimes, but particularly substances not easily digested, are mostly the exciting causes.

What are its characteristics? Pain in the stomach and bowels, sooner or later after eating, occurring in paroxysms, with short remissions, eructations of wind, and torpid bowels. It may be distinguished by the relief obtained from abdominal pressure, the writhing motions of the patient, and the absence of fever. From *bilious colic* by the absence of bilious vomiting; and from *colica pictonum* by the hardness and retraction of the abdominal muscles, and the gradual accession of the colic produced by lead.

What is the treatment? When the symptoms are slight, frictions with a flannel or a brush, and the milder carminatives and antispasmodics are all that may be required. When more severe, camphor, ether, laudanum, &c. may be necessary; but when the irritating substance still remains, and the pains do not abate, proper evacuants must be resorted to: emetics, if the offending substance is still in the stomach; and cathartics, or laxatives, if it have passed into the intestines. Revulsives, such as sinapisms, heat, &c. applied to the abdomen are useful. In convalescence great care should be taken in regard to diet.

Bilious Colic.

What is bilious colic? It is a variety of colic with manifest derangement of the biliary organs.

What are the causes? It depends upon the same remote

causes which produce intermitting and other forms of miasmatic fevers; and generally occurs during the autumnal months.

What are the symptoms? In the first stages the symptoms resemble those in the forming stages of miasmatic fevers. These are followed by acute pain in the stomach and bowels, which is very severe during the exacerbations. As the disease advances the abdomen becomes tender to the touch. Nausea and bilious vomiting occur often at the commencement of the disease, the bowels are torpid, the pulse is not much disturbed at first, but becomes increased in fullness, force, and frequency, as the disease advances, and there are symptoms of bilious derangement.

What is the treatment? The principal indications are, to free the bowels of their irritating contents; to allay the morbid irritability of the stomach and intestinal tube, and to restore the healthy secretions of the liver. The first indication can be accomplished by an emetic, if free vomiting does not exist, and by cathartics as soon as they can be brought to act; but from the usual irritable condition of the stomach, this cannot at once be done; *calomel*, in small doses repeated, then becomes the most important remedy conjoined with revulsives, which will generally allay the irritability of the stomach, and bring the system under its peculiar influence; which is favorable to the operation of cathartics, and the restoration of the secretions. As a purgative, castor oil and spirits of turpentine, as soon as the stomach will bear them, will be found beneficial. Warm bath, fomentation, blood-letting, &c. may be found useful during the course of treatment, according to the condition of the system.

PART VII—POISONS.

What are poisons? Substances which produce death or serious injury when applied in considerable quantities, either externally, or internally.

Are poisons similar in their action? No; each one produces symptoms peculiar to itself.

What is the first great object in the treatment of poisons? To administer an antidote.

How many kinds of antidotes are there? Two; one destroys the deleterious qualities of the poison before its injurious action is developed; and the other controls the poisonous action after it has been established.

What other means are resorted to? Evacuation of the stomach either by an emetic, or stomach pump, when taken internally; and by excision, or the application of a cupping glass, if applied externally.

Acids.

What are the symptoms of poisoning by nitric, muriatic, and sulphuric acids? Burning heat in the mouth, œsophagus, and stomach, acute pain, eructations, nausea, hickup, vomiting, tenderness of abdomen, coldness of surface and extremities, depressed pulse, horrible contortions, excessive thirst, and generally a fatal termination.

What is the treatment? Repeated doses of magnesia, alkalies or their carbonates, and alkaline earths, as antidotes; mucilaginous drinks, olive, or almond oil in large quantities, emollient fomentations, and clysters.

Alkalies.

What are the antidotes? Vegetable acids, of which common vinegar is the best; also fixed oils in large quantities.

Antimony.

By what preparation of antimony is poisoning usually produced? The emetic tartar.

What are the effects as a poison? A severe metallic taste, nausea, copious vomiting, hickup, burning pain in the stomach, colic, frequent stools and tenesmus, difficult respiration, fainting, small quick pulse, cold skin, loss of sense, cramps, prostration, and death.

What is the treatment? If emesis does not take place it should be promoted by tickling the throat, and diluent drinks; antidotes should be administered; among which are decoction of galls, Peruvian bark, common tea, &c. If the vomiting is excessive give laudanum, and apply revulsives freely; the consecutive treatment should be adapted to the condition of the disease existing.

Arsenic.

What preparation of arsenic is generally used in poisoning? The arsenious acid, sometimes called white oxide.

What are the symptoms? It is a violent poison, whether applied internally or externally. Its symptoms are an austere taste, hawking, constriction of the throat, hiccup, nausea, anxiety, frequent sinkings, pain at the precordia, vomiting, black fœtid stools, frequent irregular pulse, insatiable thirst, delirium, convulsions, loss of feeling, especially of the feet and hands, and death.

What are the usual morbid appearances after death? Inflammation of the mouth, stomach, and intestines; spots resembling eschars on the stomach and duodenum; perforations of their coats; and the villous coat of the stomach is reduced to the consistence of a reddish brown pulp.

What is the treatment? Before the antidote can usually be procured the poison should be dislodged by an emetic of sulphate of zinc or copper, tickling the throat, &c. or by the stomach pump. Demulcents should be freely given both before and after vomiting. As an antidote in all cases for the poisonous compounds of arsenic, the hydrated sesquioxide of iron in a *moist* or *pulpy* state should be given as soon

as possible in doses of a tablespoonful to an adult, of a dessertspoonful to children, every five or ten minutes until urgent symptoms are relieved. The after symptoms should be combated on general principles.

As the hydrated sesquioxide of iron is the only known antidote to be relied on in cases of poisoning by arsenic, I will here give the formula for its preparation. Every apothecary, and country physician should keep it always on hand.

Hydrated Peroxide of Iron.

℞.	Sulphuric acid (67° Baume,)	8 oz.	16 parts.
	Iron wire,	8 oz.	16 "
	Nitric acid, (49° Baume,)	5½ oz.	11 "
	Water of ammonia,	q. s.	
	Water.	1¼ gal.	384 "

Mix the sulphuric acid with the water in a glass vessel; then add the iron; and after the effervescense has ceased, filter. Add the nitric acid in divided portions, and apply heat so long as orange colored fumes are given off. To the heated solution pour in the water of ammonia until a decided excess has been added; then wash the precipitate by decantation until the washings give no precipitate with nitrate of baryta. The water is then to be drawn off until just enough remains to give the consistence of thick cream. It should then be kept in bottles of convenient size for use, and given as above when required.

BARYTES.

What preparations of baryta are poisonous? The carbonate, muriate, and nitrate.

What are the symptoms produced by large doses? Violent vomiting, purging, and other dangerous symptoms.

What is the treatment? Dilute sulphuric acid, and the soluble sulphates are antidotes, converting it into an insoluble sulphate of baryta. Emetics should also be given.

COPPER.

What are the poisonous preparations of copper? The acetate and sulphate. Poisoning, from copper, usually occurs from the careless use of culinary vessels, or mineral water fountains.

What are the symptoms of poisoning by the salts of copper? A coppery taste, pain in the head, nausea, vomiting, catharsis, colic, cramp, convulsions, insensibility, and death.

What is the treatment? Albumen, in the form of white of eggs, copious draughts of warm milk, and brown sugar, or molasses are the best antidotes. Iron filings are also used.

Gold.

What is the poisonous preparation of gold? The nitro-muriate.

What is the antidote? Sulphate of iron which precipitates the gold; mucilaginous drinks should also be freely used.

Lead.

What are the poisonous preparations of lead in common use? The carbonate and acetate.

What is the most common form of the effects of poisoning by lead? Colica pictonum.

What is the best prophylactic? The constant use of dilute sulphuric acid in some form or other.

What is the proper antidote for the preparations of lead? The soluble sulphates, as magnesia or soda, and the phosphate of soda. Emesis should also be produced by sulphate of zinc.

Mercury.

What are the poisonous preparations? They are all, but corrosive sublimate in particular.

What are the symptoms of poisoning by corrosive sublimate? It produces an intolerable astringent taste, constriction of the gullet, nausea, vomiting, burning pain, diarrhœa, and a flushed swollen face.

What is the treatment? Albumen of eggs, or gluten in the form of unboiled wheat flour paste, should be copiously swallowed as an antidote and the stomach evacuated either by an emetic or the stomach pump. If neither albumen nor gluten is at hand, milk should be drank freely.

The treatment for its effects should be conducted on general principles for the reduction of inflammation, &c.

Nitre.

What are the symptoms produced by a poisonous dose of nitre? Heat and pain in the stomach, vomiting and purging of blood, prostration, convulsions, and death.

What is the treatment? Its speedy removal by an emetic or stomach tube, the administration of demulcent drinks, laudanum, cordials, &c. There is no known antidote.

Oxalic Acid.

What are the symptoms produced? It produces death suddenly and certainly, in large doses.

When concentrated it produces exquisite pain, followed by violent efforts to vomit, then sudden dullness, languor, debility, and finally death, without a struggle. When diluted largely it is neither corrosive or very irritating, but causes death by its action on the brain, spinal marrow and heart.

What is the treatment? Remedies should be applied promptly. The antidotes are, chalk or magnesia, mixed with water and administered in large quantities. If the antidotes are not at hand, the stomach should be speedily evacuated by the usual means. Avoid warm water and the alkalies.

Silver.

What preparation of silver is most likely to be used as a poison? The nitrate.

What are the symptoms? The usual effects of the corrosive poisons.

What is the treatment? Common salt is the proper antidote. Mucilaginous drinks should be freely given so as to produce vomiting. Consecutive inflammations should be treated according to the indications.

Tin.

What are the proper antidotes for the salts of tin? Eggs or milk in large quantities.

Zinc.

What is the remedy for an over dose of the sulphate of zinc? Warm water, emolient drinks, milk, and albumen.

Narcotics.

What is the general treatment applicable where narcotics have been swallowed? Active emetics, of which sulphate of zinc in large doses stands first, the stomach pump and tube should also be used to wash out this organ, after which coffee, vegetable acids, &c., are proper. There are no antidotes to be absolutely relied on.

Opium.

What are the symptoms of poisoning by opium and its proximates? The pulse is reduced in frequency but not in

force, muscular strength is diminished, there is languor, drowsiness, apoplectic sleep, stertor, suffusion of countenance, insensibility, coma, full, slow pulse, followed by cold clammy skin, cold extremities, pallid countenance, thread like pulse, interrupted gasping respiration, and death, unless relief is afforded.

What is the treatment? Evacuation of the stomach by the pump, or an active emetic, of which sulphate of zinc is the best, and its action should be promoted by the usual means. After the stomach has been evacuated, dilute vinegar, stimulants, sinapisms, and frictions, may be called for.

The patient should be bled if necessary, kept roused as much as possible by cold to the head, and by the action of an electric or electro-magnetic machine, or flagellation; and artificial respiration should also be kept up, until the system can rally.—An infusion of galls has been considered as an antidote, but there is no course to be relied on excepting the above.

Hydrocyanic Acid.

What are the symptoms in poisoning by it? It is so rapid in its action that it is seldom treated by a physician. When it is not at once fatal, the symptoms are sudden loss of sense, trismus, difficult and rattling respiration, coldness of the extremities, a smell of bitter almonds proceeding from the mouth, small pulse, swelling of the neck, immobility of the pupils, sometimes contracted, and at others dilated, convulsions, &c.

What is the treatment? The antidotes are chlorine water, ammonia, cold effusion, and artificial respiration.

Buckeye, (*Esculus Ohioensis.*)

What is its antidote? Chlorine, iodine, and bromine.

Chlorine, (*gaseous.*)

What is the antidote? Inhale ammonia cautiously.

Digitalis.

What are the symptoms of a poisonous dose? Nausea and vomiting, stupor or delirium, cold sweats, prostration, hiccup, convulsions, and syncope.

What is the treatment? Evacuation of the stomach as speedily as possible, and counteract its effects by stimulants, as brandy, ammonia, &c. Infusion of yellow bark is considered as its antidote.

Ipecacuanha.

What is the proper treatment for an over dose? Chlorine, iodine, and bromine, are considered as antidotes, but the general treatment should be that which is indicated by the general symptoms.

Jalap.

What is the treatment? Antidotes, same as preceding, general treatment according to the symptoms.

Strammonium.

What are the symptoms when taken in a poisonous dose? Cardialgia, thirst, nausea and vomiting, sense of strangulation, anxiety, and faintness, defect or loss of vision, dilatation of the pupils, vertigo, delirium, tremors, palsy, stupor, convulsions, and sometime death.

What is the proper treatment? Evacuation of the stomach. Antidotes, same as the preceding.

Nux Vomica.

What are its poisonous symptoms? Difficult and confined breathing, retching to vomit, tremors, spasms, convulsions, and death, sometimes takes place.

What is the treatment? Antidotes same as preceding.—Evacuation of the stomach, and general treatment according to symptoms.

Phosphorus.

What are the symptoms of poisoning by phosphorus? The principal one is violent pain and irritation of the stomach.

What is the treatment? The stomach should be evacuated, and magnesia and water freely given as an antidote, both before and after vomiting.

Stings of Insects.

What is the proper remedy? Wash in water of ammonia.

Bites of Serpents and Rabid Animals.

What is the remedy? Cut out the part if it can be done early, apply a ligature, and cup the wound.

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